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400A NAV-O-MATIC AUTOPILOT

SERVICE PARTS MANUAL

Cessna.

SERVICE MANUAL CHANGE NOTICE

REFERENCE MANUAL NUMBER: D4522-13 & D4523-13 **DATE:** 2-21-75

MANUAL TITLE: 400A Nav-O-Matic & IFCS Service/Parts Manual

TO: Cessna Zones, Dealers and Operators CS75-6

FROM: CUSTOMER SERVICES DEPARTMENT

CORRECT YOUR SERVICE MANUAL AS SHOWN BELOW.

PAGE NUMBER	PARAGRAPH NUMBER	DESCRIPTION OF CHANGES
2-5/2-6	Table 2-1	Elevator pitch actuator part number and torque setting for the model 340 should read as follows:

Aircraft Model	Elevator (Pitch) Actuator	
	Part Number	Torque Setting (lb-in)
340	35070-0328	17 ± 1
*340	35070-0428	$27 \pm \frac{2}{4}$

* 340-0501 and on

SERVICE / PARTS MANUAL

400A
NAV-O-MATIC
AUTOPILOT

This manual contains recommended service information and illustrated parts breakdown applicable to the Cessna 400A Nav-O-Matic Autopilot. This information is supplemented and kept current by Service Letters and Service News Letters published by Cessna Aircraft Company. Recommended replacement parts for the 400A Nav-O-Matic Autopilot are available from the Cessna Dealers' Organization.

This Service/Parts Manual Supersedes D833-13, Dated May 1970 and D4511-13, Dated April 1973

CESSNA AIRCRAFT COMPANY

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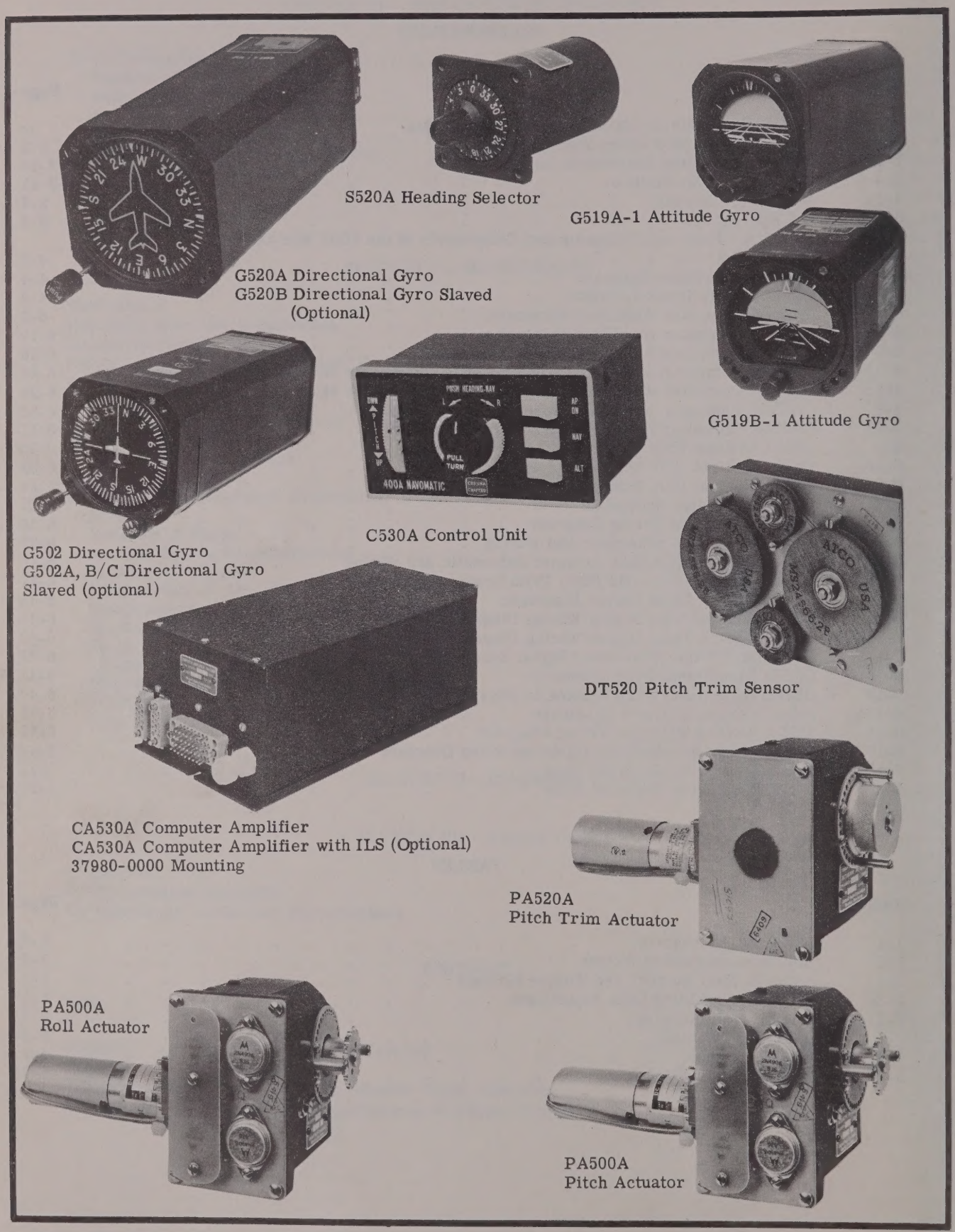


Figure 1-1. Cessna 400A Nav-O-Matic Autopilot Major Units

SECTION I

General Information

1-1. PURPOSE.

The Cessna 400A Nav-O-Matic is a two-axis automatic flight control system that governs the positions of the ailerons and elevators. About the roll axis, it provides lateral stability, heading hold, command turn and automatic intercept and tracking of any VOR radial. In addition to holding the wings level and compensating for rotation about the pitch axis, the system provides an automatic intercept and track of any magnetic heading or VOR radial. About the pitch axis, it provides command pitch attitude hold, aircraft altitude hold, automatic pitch trim, and an optional ILS coupler.

1-2. SPECIFICATIONS.

Input Power	28 Volts DC
Power Requirement:	5.0 Amps at 28 Volts
Actuator Disconnect Mechanism	Electric Clutch
Actuator Overpower Mechanism	Mechanical Slip Clutch
Actuator Torque	50 inch-pounds Maximum
Component Weight	See Table 1-2

1-3. UNITS AND ACCESSORIES.

Table 1-1 lists the Units and Accessories available for use with the Cessna 400A Nav-O-Matic Autopilot.

1-4. DESCRIPTION OF UNITS.

Computer Amplifier.

The Computer Amplifier is the major unit of the 400A Nav-O-Matic. With the exception of a dc servo amplifier in each of the actuators, all electronic circuits for the system are contained in this unit. The computer amplifier also houses the altitude sensor mechanism. Most of the electronic system adjustment controls are contained in this unit. Individual solid state modular assemblies are used in the unit. These modules are individually replaceable. Model assembly A1 contains all of the system variables, which adapt the 400A Nav-O-Matic Autopilot to the various types of aircraft, and are used to establish constants for the circuit. Except for the voltage monitor circuit in the control unit, all system switching circuits are included in relay assembly A2. Roll assembly A3 and pitch assembly A4 contain the roll signal and pitch signal amplifiers. Roll radio assembly A5 is used for VOR-LOC operation, while the pitch radio assembly A6 (Altitude Hold Interlock) is an optional module used only when an approach coupler is part of the aircraft electronic configuration. Power supply assembly A7 converts the aircraft power to the various power requirements of the autopilot system and altitude sensor assembly A8 houses the altitude sensor mechanism. Crosswind integrator assembly A10 provides supplementary crosswind compensation in units containing this assembly. Chassis assembly A9 mounts and interconnects these assemblies and provides for interconnection to the other units of the 400A Nav-O-Matic system.
Electrical input and output connections in the computer amplifier are made through three connectors on the front of the unit. A nylon fitting adjacent to the electrical connectors connects to the aircraft static source or vents to cabin static pressure for altitude sensing. Holes are provided in the top of the unit dust cover for system adjustments.

Control Unit.

The C-530A Control Unit is a panel-mounted unit which contains most of the operating controls for the autopilot. The control functions are described in Table 3-1. The unit also includes a power monitor circuit which turns off the autopilot in the event of failure in the autopilot power supply. An attitude gyro disable switch on the rear of the unit, when pressed down, disconnects the gyro from the system. The dust cover serves as a mounting for the control unit and is permanently attached to the instrument panel with four mounting screws. A rotatable tab, controlled by a screw on the front panel, secures the control unit in the dust cover. Input and output connections to the control unit are made through two connectors on the rear of the unit.

Attitude Gyro.

The Attitude Gyro is a vacuum driven, panel-mounted instrument which provides a visual indication of the aircraft pitch and roll attitude. Also, autopilot electrical signals representing pitch and roll deviations from straight and level flight are generated by AC pickoff windings mounted in the pitch and roll axes. The voltages representing the deviation and AC input voltages to the units from the other parts of the system are routed through a connector mounted on the rear of the instrument.

Directional Gyro.

The Directional Gyro supplies heading information for the autopilot. The G-520 series or the later G-502 series gyros are available for use in the 400A Nav-O-Matic installation.

The G-520A and the slaved G-520B both are vacuum driven gyros. When the G-520B is selected, the optional CT-520A Flux Detector must also be included as well as the S-520A Heading Selector.
The gyros are panel-mounted instruments which provide a stable visual indication of aircraft heading to the pilot and provide electrical heading

information to the autopilot. In the G-520A and the G-520B, electrical heading data is furnished by a synchro control transmitter which is linked to the dial. A gyro calibration control on the front of the instrument allows the pilot to set the gyro to correspond with the aircraft heading and allows recalibration as required to prevent precession. The G-520A or G-520B installation requires the S-520A Heading Selector to select the heading. Power input and signal connections are routed through two connectors mounted on the rear of the instrument.

The G-502A Directional Gyro is a vacuum driven, panel-mounted instrument that provides a stable visual indication of aircraft heading to the pilot by means of a rotating circular dial. A gyro adjustment knob (PUSH) permits the pilot to set the gyro to correspond with the magnetic heading indicated by the compass and allows readjustment as required to offset precession.

The heading selector control knob (HDG) positions the heading selector index to the desired heading to be held when the control unit PULL TURN control is pushed in. A linear transformer provides the autopilot with an electrical error signal proportional to the deviation of the indicated heading from the selected heading. Power input and signal output connections to the linear transformer are made through connector on the rear of the gyro case.

The optional G-502B and G-502C Slaved Directional Gyro are similar to the G-502A Directional Gyro except for the addition of the slaving feature which automatically maintains the correct gyro magnetic heading, eliminating the periodic readjustment required to offset precession. When the G-502B or G-502C gyro is used, the CT-502A Flux Detector and the IN-502A Slaving Meter must also be included. Power input and signal connections are made through two connectors on the rear of the gyro case.

Actuators, Roll and Pitch.

Two PA-500A Actuators are required for a 400A Nav-O-Matic installation. One actuator provides the force to control the ailerons and the other provides the force to operate the elevator. Each actuator consists of a six-transistor dc servo amplifier, a servo motor, and the clutch and gear train parts. The dc amplifier amplifies the error signal input to control the servo motor. The clutch is electromagnetic and provides a positive disconnect between the actuator and its mechanical linkage output. Particular attention should be paid to the actuator part number and the function it performs in a particular aircraft. A number of actuators are available and differ in voltage, torque, clutch parts and motor speed. The actuators should not be interchanged unless the part number is the same and the torque setting checked before actual flight.

Actuator, Pitch Trim. The PA-520A and PA-520B Pitch Trim Actuators are similar to the PA-500A Actuator except that they do not include the servo amplifier. The pitch trim actuator converts the electrical signal from the pitch trim sensor to mechanical motion to drive the elevator trim tab to maintain the required pitch attitude.

Automatic Pitch Trim System.

A pitch trim sensor and a trim actuator comprise the Automatic Pitch Trim System. The pitch trim sensor senses the differential tension between cables leading to the pitch actuator. A polarity sensing switch converts the error to an electrical signal to drive a power amplifier which operates the pitch trim actuator. The pitch trim actuator converts the signal from the sensor to mechanical motion to drive the trim tab to maintain a predetermined flight attitude .

Flux Detector.

The CT-502A Flux Detector is a remotely mounted device which senses the direction of the earth's magnetic field. It is used in conjunction with an external exciting current source and amplifier, and provides magnetic reference data to a magnetic heading transducer of a slaved directional gyro. The flux detector is a sealed unit and has no moving parts or adjustments. When the unit is installed in the aircraft, and aligned with the line of flight, it usually requires no further servicing. Electrical interface with the unit is provided by an attached cable and connector plug. Slotted cutouts in the mounting flange are used for mounting.

Slaving Meter.

The IN-502A Slaving Meter is a zero-center-scale meter used to monitor heading displacement between a slaved directional gyro and a flux detector. When an error exists between the two heading signals, the slaving meter deflects in either direction depending on the polarity of the error. As the gyro slaving circuit acts to correct the error, the slaving meter needle slowly returns to the center position, a null indicates that the gyro heading indication is correct.

The slaving meter is a panel-mounted, 100-0-100, sealed microammeter with a full-scale deflection in either direction of approximately 4.7 volts. Electrical connections are made to the positive and negative solder terminals on the back of the instrument.

TABLE 1-1. UNITS AND ACCESSORIES

Qty	Name	Type	Part No.
1	Actuator Roll	PA-500A	35070-0028
			35070-0128
			35070-0228
			35070-0328
			35070-0428
1	Actuator Pitch	PA-500A	35070-0128
			35070-0328
			35070-0728
1	Computer Amplifier (without ILS Coupler)	CA-530A	37970-0128
			37970-1128
			37970-0228
			37970-1228
			37970-5028
			37970-6028
1	Computer Amplifier (with ILS Coupler)	CA-530A	37970-0028
			37970-1028
			37970-4028
			37970-0328
			37970-1328
			37970-7028
1	Control Unit	C-530A	37960-1028
1	Gyro, Attitude	G-519-1	37570-0001
			37570-0105
		G-519B-1	37570-0002
			37570-0106
1	Gyro Directional	G-502A	40760-0104
			40760-0105
		G-520A	30370-0100
		G-502B	40840-0104
			40840-0105
1	Gyro Directional (Slaved with Bootstrap)	G-502C	40840-0204
			40840-0205
		G-520B	38180-0100
1	Flux Detector (used with G-502B/C)	CT-502A	41370-0000
1	Flux Detector (used with G-520B)	CT-520A	38170-0000
1	Slaving Meter (used with G-502B/C)	IN-502A	40910-0000
1	Slaving Meter (used with G-520B)	IN-520A	38190-0000
		IN-520B	38530-0000
1	Automatic Pitch Trim System, consisting of:	AF-529A	38480-1028
			38480-1038
			38480-1058
1	Actuator	PA-520A	38100-0028
			38100-0128
			38100-0228
1	Actuator	PA-520B	40280-0028
			40280-0328
1	Pitch Trim Sensor	DT-520A	37580-0028
			37580-1028
			37580-1038
			37580-0014
1	Trim Regulator	------	4285
1	Connector Kit	- - - - - - - -	38423-0013
	Connector	---------	28326-0007
1	Mounting (for CA-530A)	---------	37980-0000
1	Connector Kit For Slaved Gyro	---------	36885-0003
			36885-0004
			36885-0005
			36885-0006
			36885-0007
			36885-0008
1	Heading Selector (used with G-520A or G-520B)	S-520A	40450

TABLE 1-2. UNIT DIMENSIONS AND WEIGHT

Type	Name	Dimensions (inches) Height	Width	Depth	Weight (pounds)
PA-500A	Actuator	3-3/4	4-1/8	8-1/8	3.1
PA-520A	Actuator	3-7/16	4-1/8	8-1/8	2.8
PA-520B	Actuator	3-7/16	4-3/8	8-1/8	2.9
CA-530A	Computer Amplifier	3-3/4	5	11	5.0
C-530A	Control Unit	2-5/8	5-1/8	4-1/4	1.6
G-519A-1	Attitude Gyro	3-3/8	3-3/8	7-5/8	2.4
G-519B-1	Attitude Gyro	3-3/8	3-3/8	7-5/8	2.4
G-520A	Directional Gyro	3-3/8	3-1/4	9-7/8	3.4
G-502B	Directional Gyro	3-3/8	3-3/8	10-3/8	4.4
G-502C	Directional Gyro (Slaved)	3-3/8	3-3/8	10-3/8	4.4
G-502C	Directional Gyro (Slaved with Bootstrap)	3-3/8	3-3/8	10-3/8	4.4
DT-520A	Pitch Trim Sensor	4	5-1/8	2-3/8	1.2
IN-502A	Slaving Meter	1-1/4	1-1/4	1-1/4	0.2
IN-520A	Slaving Meter	1-1/2	1-1/2	1	0.3
IN-520B	Slaving Meter	1-1/2	1-1/2	1	0.3
S-520A	Heading Selector				0.4
CT-502A	Flux Detector	2-1/4	3-1/2	3-1/2	0.6
CT-520A	Mounting	1-1/16	5-1/8	11	0.5

SECTION II

Installation Adjustment

2-1. PREINSTALLATION ADJUSTMENTS.

General. The preinstallation adjustment procedures given in this section pertain to all units and are accomplished using the patch cable shown in figure 2-1. On some earlier units it will be necessary to connect the probe of the VTVM to the individual plug instead of the test point on the test unit assembly. Reference will be made to the test points on the test unit and the plug and pin number on the computer. Example: TP4, (P5, pin M).

Turn autopilot switch to ON and allow components to warm up for a period of at least 5 minutes. All voltage measurements should be made with a Hewlett-Packard Model 412 VTVM and a Ballantine Model 300H VTVM or their equivalent.

NOTE

The pitch command wheel on the C-530A controller must be synchronized and stationary prior to starting adjustments.

Actuator Mechanical Clutch Torque Adjustment.

Refer to Table 2-1 for torque requirement for aircraft Model and to actuator exploded view (figure 7-1) and adjust the torque of the mechanical clutch as follows:

Step 1. Remove four screws (2, figure 7-1) and remove plate assembly (1) from top of actuator.

Step 2. Connect adapter cable between plate assembly and actuator to extend internal wiring.

Step 3. Attach torqometer adapter to torqometer and insert adapter studs into holes in actuator sprocket.

Step 4. Set AP-ON switch on autopilot controller to ON to energize actuator and allow clutch gear and sprocket to assume a neutral position.

Step 5. Manually turn the sprocket on the pitch actuator CW or CCW until the pitch motor stops running. This step is not required for roll actuator.

Step 6. With torqometer, overpower actuator in both directions and determine torque adjustment (if any) required for particular aircraft.

Step 7. Insert screwdriver blade between tab of spring tension washer (115, figure 7-1) and spur gear (119) to dislodge pin (117) from index washer (120).

Step 8. Using suitable tool (drift or solid end of drill bit) loosen or tighten spur gear (119) as required to achieve proper torque.

Step 9. Remove screwdriver blade and make sure pin (117) is inserted in hole in index washer (120).

Step 10. Turn off power and reassemble actuator.

2-2. POWER SUPPLY REGULATION.

See Test Equipment and Accessories, Section 5, for equipment required and make the following adjustments:

Step 1. Remove cover from computer. Connect system to test set as shown. Place the test set circuit breakers to the IN position and the test set power switch to the OFF position. Place the following switches as shown:

Engage-Disengage to Engage
VOR/LOC-GS to VOR/LOC
LOC ENABLE to OUT
Flap Input to OUT
Motor to ON
GS Disable to OUT

Connect +28Vdc to the test set power terminals and a VOR/LOC-GS simulator to the L/R - UP/DN terminals. If an attitude or directional gyro simulator is used these signals can be injected and checked for level at the following test points:

Attitude Gyro Pitch TP4 (J1 pin M)
Roll TP14 (J1 pin J)
Directional Gyro TP23 (J1 pin K)
Reference TP8 (J1 pin m)

If the aircraft gyros are used connect them to the test as shown in figure 2-1.

Step 2. Connect dc voltmeter to TP20 (J1 pin n). Reference TP8 (J1 pin m). Check line voltage for +27.5Vdc and adjust if required.

Step 3. Connect dc voltmeter to TP19 (J1 pin g). Reference TP8 (J1 pin m). Check +6Vdc +1%. If the reading is out of tolerance (see figure 2-2) and adjust A7R30 to obtain correct voltage.

Step 3. Connect dc voltmeter to TP19 (J1 pin g). Reference TP8 (J1 pin m). Check +6Vdc ±1%. If the reading is out of tolerance (see figure 2-2) and adjust A7R30 to obtain correct voltage.

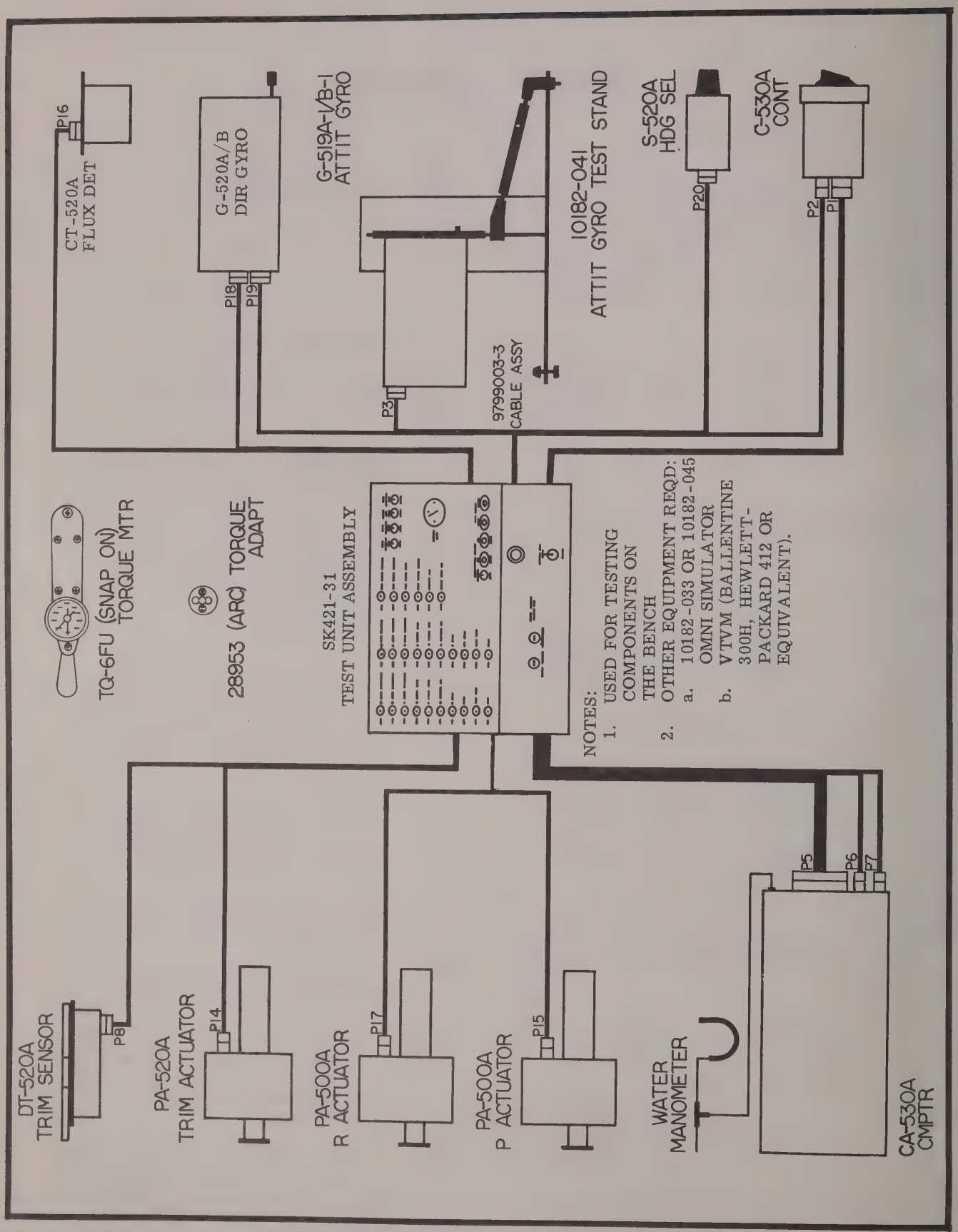


Figure 2-1. Typical Test Interconnect Diagram (Sheet 1 of 3) (1972 Model)

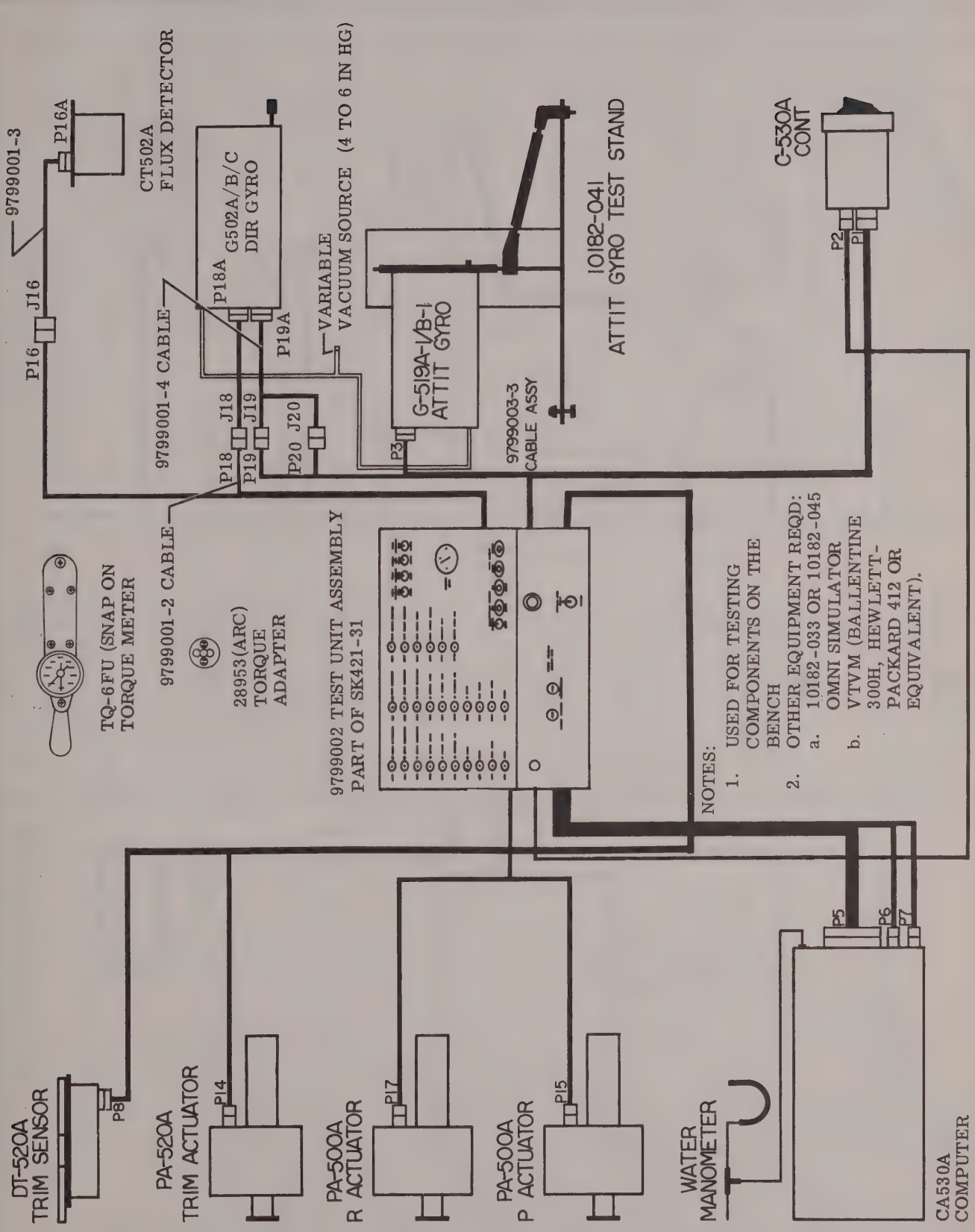


Figure 2-1. Typical Test Interconnect Diagram (Sheet 2) (1973 & 1974 Model)

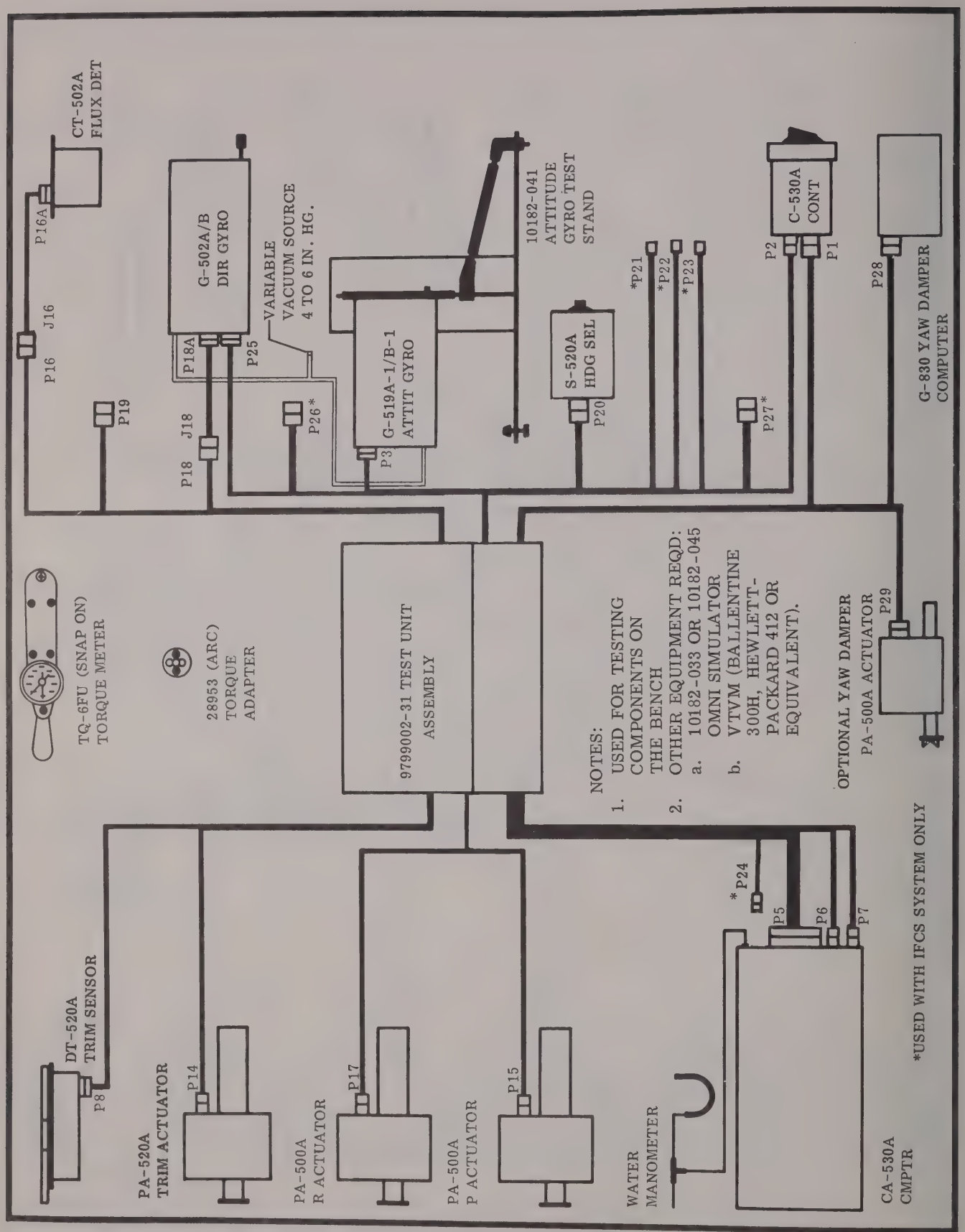


Figure 2-1. Typical Test Interconnect Diagram (Sheet 3) (1974 Model)

TABLE 2-1. ACTUATOR PART NUMBER AND TORQUE SETTINGS

Aircraft Model	Elevator (Pitch) Actuator		Aileron (Roll) Actuator		Trim Actuator	
	Part Number	Torque Setting (lb-in)	Part Number	Torque Setting (lb-in)	Part Number	Torque Setting (lb-in)
210	35070-0728	12 ±1	35070-0028	15 ±1	40280-0328	29 ±1
310/T310	35070-0328	15 +0, -2	35070-0428	25 +0, -2	38100-0128	25 +0, -2
337	35070-0128	10 ±.5	35070-0028	30 ±3	40280-0028	15 ±1
340	35070-0328	17 ±1	35070-0228	23 +0, -3	38100-0128	25 +0, -2
401	35070-0328	15 +0, -2	35070-0428	25 +0, -2	38100-0128	25 +0, -2
402	35070-0328	15 +0, -2	35070-0428	25 +0, -2	38100-0128	25 +0, -2
414	35070-0328	15 +0, -2	35070-0428	25 +0, -2	38100-0128	25 +0, -2
421	35070-0328	17 ±1	35070-0228	31 ±1	38100-0128	25 +0, -2

TABLE 2-2. ATTITUDE GYRO PITCH GAIN ADJUSTMENT

Aircraft Model	DC Voltage Reading
210	-2.7Vdc
310/T310	-1.35Vdc
337	-4.42Vdc
340	-1.68Vdc
401	-1.35Vdc
402	-1.35Vdc
414	-1.35Vdc
421	-1.35Vdc

Step 4. Reverse dc voltmeter leads and connect negative lead to TP9 (J1 pin h). Reference positive lead TP8 (J1 pin m). Check for -6Vdc ±1%. If the reading is out of tolerance (see figure 2-2) and adjust A7R21 to obtain correct voltage.

NOTE

Adjustment of either + or - 6V line will necessitate a complete computer alignment because all null points will shift with the adjustments of ±6 volts.

Step 5. Lower the line voltage to 24Vdc. The ±6 volt regulators must maintain the ±1% tolerance and there must be no pitch or roll actuator movement.

Step 6. Raise the line voltage to 31.0Vdc. The ±6 volt regulators must maintain the ±1% tolerance and there must be no pitch or roll actuator movement. Return line voltage to +28Vdc.

If steps 5 and 6 cannot be accomplished adequately the computer power supply is not regulating properly and must be corrected before continuing.

Computer Amplifier Pitch Channel Adjustments.

When computer amplifier adjustments are made on the bench it will be necessary to simulate proper inputs to the computer during alignment such as attitude gyro, heading/course datum and VOR/LOC-GS signals. In lieu of the simulators an attitude gyro, directional gyro and heading selector from the Nav-O-Matic 400A Autopilot may be placed on the test stands and used for bench alignment.

The following steps 1 through 14 pertain to the pitch channel adjustments:

Step 1. With the pitch channel synchronized, connect dc voltmeter to TP5 (J1 pin Z) with reference to TP8 (J1 pin m).

Step 2. Adjust the pitch command wheel on the autopilot control unit for an indication of zero ±10 millivolts on the dc voltmeter. This is the level or neutral (electrical center) of the pitch command.

Step 3. Connect the ac VTVM to TP4 (J1 pin M) with reference to TP8 (J1 pin m) to measure pitch gyro signal.

Step 4. Adjust the gyro or gyro simulator as follows:

a. Adjust gyro for level flight altitude.
b. If simulator is used adjust for minimum.
c. Read ac VTVM. Reading should be 0 (less than 80 millivolts) ac. Adjust gyro for less than ±30 millivolts dc at TP3. If gyro indicates more than 1° up or down, it is defective.

Step 5. Disconnect pitch actuator at J3 of the computer amplifier. Connect the dc voltmeter to TP7 (J1 pin D) with reference to TP8 (J1 pin m). Refer to figure 2-2 and adjust A4R24 for zero ±10 millivolts. Connect the pitch actuator to J3 of computer amplifier.

Step 6. Connect the dc voltmeter to TP6 (J3 pin K) with reference TP8 (J1 pin m). See figure 2-2 and adjust A4R30 for zero ±10 millivolts.

Step 7. Recheck TP5 (J1 pin Z for zero volts). If voltage has changed, repeat steps 1 through 6.

Step 8. Ground pin 39 on A4 (figure 2-2) fourth pin opposite heat sink. Connect the dc voltmeter to TP24 (J2 pin F) with reference to TP8 (J1 pin m). Adjust A4R9 (figure 2-2) for zero ±10 millivolts. Remove ground from pin 39 on A4, then adjust A4R7 for zero ±10 millivolts.

Step 9. Engage altitude hold on autopilot control unit. If the pitch actuator sprocket rotates more than ±5° (less than 1/2 tooth on sprocket) or the voltage on TP6 (J3 pin K) changes more than 10 millivolts, repeat steps 5 through 8. Disengage altitude hold.

Step 10. Check that motor switch S6 is ON. Repeat steps 1 and 2. Connect the dc voltmeter to TP5 (J1 pin Z) with positive lead to TP8 (J1 pin m). Turn autopilot ON-OFF switch to OFF and adjust pitch command wheel up. Hold but do not move the pitch actuator sprocket. Engage autopilot, the pitch command should rotate toward center, electrically and physically. The dc voltmeter should drive to zero.

NOTE

During the rotation of pitch command wheel back toward center, the sprocket must be held stationary.

Step 11. Check that motor switch S6 is ON. Repeat steps 1 and 2. Turn autopilot switch off and adjust pitch command wheel down. Hold but do not move the pitch actuator sprocket. Engage autopilot, the pitch command wheel should rotate toward the center, electrically and physically. The dc voltmeter should drive to zero.

NOTE

During the rotation of pitch command wheel back toward center, the sprocket must be held stationary.

Step 12. Connect ac voltmeter to TP4 (J1 pin M) with reference to TP8 (J1 pin m). Adjust the attitude gyro or gyro simulator for 0.6 ±.16 millivolts (10° up). Check TP5 (J1 pin Z) is still zero Vdc. (Refer to steps 1 and 2.) Connect dc voltmeter to TP6 (J3 pin K) with positive lead referenced to TP8 (J1 pin m). Refer to Table 2-2 for proper voltage reading. If necessary, adjust A1R34 (figure 2-2) to obtain the correct reading.

Step 13. Connect ac voltmeter as in step 12. Adjust gyro or gyro simulator up for 0.8 volts ±0.16 millivolts (15° up approximately). Adjust pitch control full up on autopilot controller. Connect dc voltmeter TP6 (J3 pin K) with reference to TP8 (J1 pin m). Adjust A1R28 (figure 2-2) for zero ±10 millivolts. For aircraft model 337 adjust gyro or gyro simulator up for +0.86 volts ±10 millivolts; for aircraft model 210 adjust gyro or simulator up for +1.53 volts ±10 millivolts.

NOTE

Entire travel of A1R28 should be checked at this time to assure adequate travel is available for in-flight adjustments. Reset A1R28 for zero.

Step 14. Repeat step 13 in opposite direction. Adjust gyro or gyro simulator down for 0.5 ±0.14 millivolts (10° down approximately). Adjust pitch control full down on autopilot controller. Adjust A1R31 (figure 2-2) for zero ±10 millivolts. For aircraft model 337 adjust gyro or gyro simulator down for -3.2 volts ±10 millivolts; for aircraft model 210 adjust gyro or gyro simulator down for +0.37 volts ±10 millivolts.

NOTE

Entire travel of A1R31 should be checked at this time to assure adequate travel is available for in-flight adjustments. Reset A1R31 for zero.

Pitch Channel Altitude Hold Adjustments.

NOTE

Steps 1 through 6 pertain to the altitude hold portion of the pitch channel.

Step 1. Level attitude or null gyro simulator for reading of zero Vac at TP4 (J1 pin M). Turn motor switch S6 to OFF. Check that pitch command voltage at TP5 (J1 pin Z) is still zero ±10 millivolts. If not, adjust pitch command wheel to obtain correct reading. Connect pressure/vacuum system to the altitude sensor air inlet tube on front of computer amplifier. Turn vacuum system on and adjust for 1 inch of water.

Step 2. Connect dc voltmeter to TP6 (J3 pin K) with reference to positive lead to TP8 (J1 pin m). Refer to Table 2-3 for proper indication on dc voltmeter. Adjust A1R37 (figure 2-2) to obtain correct reading. Connect dc voltmeter to TP24 (J2 pin F). Refer to Table 2-3 for proper indication.

NOTE

If the voltage varies more than 10 millivolts during a period of one minute, with constant vacuum or pressure, check altitude sensor and connections for leaks.

Step 3. Turn motor switch (S6) on, disengage altitude hold switch on autopilot control unit, remove pressure from computer amplifier and remove plug J4 from altitude sensor (A8 assembly). Connect dc voltmeter to TP24 (J2 pin F) with reference to TP8 (J1 pin m). Apply a dc voltage to J4 pin F and adjust for an indication of 1.5 Vdc at TP24 (J2 pin F). Turn autopilot ON-OFF switch to OFF and back to ON. Press altitude hold switch momentarily and observe altitude hold will not engage.

Step 4. Reduce voltage at J4 pin F to obtain a reading at TP24 (J2 pin F) of 1Vdc. Slowly reduce voltage at TP24 (J2 pin F) while attempting to engage altitude hold. At the point the altitude hold engages, the voltage at TP24 (J2 pin F) should be between 200 and 700 millivolts dc.

Flap Limiting Check.

NOTE

This check is not applicable to computers without A1VR5. Reference Figure 6-2, sheet 1 for effectivity.

Step 1. Connect dc voltmeter to junction of resistors A1R40 and A1R45 or the cathode of diode A1VR5 (figure 2-2). Apply a dc voltage at A1 pin 43 of +10 to +15 volts, the dc voltmeter should indicate 8.2 ±.8 volts. If indication cannot be obtained, check for proper test connections and if they are proper, it will be necessary to check A1R45, A1R40 and A1VR5 for proper value.

NOTE

Computer amplifier pitch radio adjustments are included in computer amplifier roll channel adjustments.

Computer Amplifier Roll Channel Adjustments.

Step 1. Connect the dc voltmeter to TP13 (J3 pin N) with reference to TP8 (J1 pin m). Adjust the gyro or gyro simulator as follows:

TABLE 2-3. ALTITUDE HOLD READINGS

Aircraft	H_2O 1" Vacuum	
	TP6 (P3 Pin K)	TP24 (P2 Pin F)
210	-.9 ±15%	-.8 ±40%
310/T310	-.56 ±15%	.8 ±40%
337	-1.0 ±15%	-.8 ±40%
340	-.88 ±15%	-.8 ±40%
401	-.56 ±15%	.8 ±40%
402	-.56 ±15%	.8 ±40%
414	-.56 ±15%	.8 ±40%
421	-.56 ±15%	.8 ±40%

a. Adjust gyro for level flight attitude.
b. If simulator is used adjust for minimum.
c. Adjust gyro for less than ±30mVdc at TP13. If the gyro indicates more than 1° roll left or right it is defective and must be replaced.

Check that the turn command knob is pulled OUT and in detent position and lateral trim knob is centered. Connect dc voltmeter to TP15 (J1 pin Y) with reference to TP8 (J1 pin m), the indication should be zero ±10 millivolts dc. It may be necessary to slightly adjust lateral trim knob to obtain proper reading.

NOTE

If turn command knob has to be moved out of detent or the lateral trim knob has to be rotated more than 5° left or right to obtain the proper indication, mechanical adjustment of either one or both the turn command and/or lateral trim potentiometer will be necessary.

Step 2. Disconnect the roll actuator from the computer amplifier at J2. Connect dc voltmeter to TP17 (J3 pin D) with reference to TP8 (J1 pin m). Adjust A3R24 (figure 2-2) for zero ±10 millivolts and reconnect the roll actuator at J2.

Step 3. Connect the dc voltmeter to TP16 (J2 pin K) with reference to TP8 (J1 pin m). Adjust A3R30 (figure 2-2) for zero volts ±10 millivolts.

Step 4. Push turn command knob in and leave in detent position. Connect dc voltmeter to TP21 (J3 pin M). Set heading selector and directional gyro or simulators to same heading. Adjust A3R48 (figure 2-2) for zero ±10 millivolts.

NOTE

Heading selector and directional gyro inputs must be the same (nulled). An ac voltmeter can be connected to TP23 (J1 pin K) with reference to TP8 (J1 pin m) to check for null .

Step 5. Connect dc voltmeter to TP22 (J1 pin i) with reference to TP8 (J1 pin m). Adjust A3R10 (figure 2-2) for zero ±10 millivolts. Check and if necessary repeat steps 2 and 3.

Step 6. Connect dc voltmeter to TP11 (J2 pin J) with reference to TP8 (J1 pin m). With no VOR/LOC input to the test box, adjust A5R4 (figure 2-2) for zero ±10 millivolts. The VOR/LOC-GS switch on the autopilot test set must be in the VOR/LOC position. Also the localizer enable switch must be in the OUT position.

Step 7. Connect dc voltmeter to TP12 (J2 pin R) with reference to TP8 (J1 pin m). With same test condition as in step 6, adjust A5R22 (figure 2-2) for zero ±10 millivolts.

Step 8. Connect dc voltmeter to TP22 (J1 pin i) with reference to TP8 (J1 pin m). With the NAV switch engaged adjust A3R10 (figure 2-2) for a reading of zero ±10 millivolts. Disengage the NAV switch, and adjust A3R48 (figure 2-2) for a reading of zero ±10 millivolts at TP22. Recheck the above readings and repeat adjustments as required. With the NAV switch engaged, perform a simulated glideslope capture (reference "Glideslope Coupling Check" step 2) and adjust A5R22 (figure 2-2) to cause the voltage on TP22 to bleed off to zero ±10 millivolts.

Step 9. Place a jumper wire across A6C1 (figure 2-2) to signal ground reference figure 2-2. The VOR/LOC-GS switch must be in the GS posi-

tion and the localizer enable switch must be in the OUT position. Connect the dc voltmeter to TP2 (J2 pin M) with reference to TP8 (J1 pin m). Adjust A6R16 (figure 2-2) for zero ±10 millivolts. Remove jumper wire from across A6C1 and signal ground.

Stap 10. With the same signal conditions and test connections in step 9, adjust A6R4 in reference to figure 2-2 for zero ±10 millivolts. Return the VOR/LOC-GS switch on the test set to the VOR/LOC position.

Roll Bank Angle Adjustment Basic Roll Versus Heading.

Prior to making the following adjustments, steps 1 through 7 of the Computer Amplifier Roll Channel Adjustment should have been checked or accomplished.

Step 1. Connect ac voltmeter to TP23 (J1 pin K) with reference to TP8 (J1 pin m) and adjust the heading selector and directional gyro or simulator to the same heading. The indication on the ac voltmeter should be zero.

Step 2. Connect dc voltmeter to TP16 (J2 pin K) with reference to TP8 (J1 pin m) and connect the ac voltmeter to TP14 (J1 pin J) with reference to TP8 (J1 pin m). Tilt attitude gyro or adjust the gyro simulator for a left bank condition and an indication of 1.1Vac on the ac voltmeter (approximately 25 ±2° bank angle). Rotate turn command knob for a full left turn (CCW) and adjust A1R9 (figure 2-2) for an indication of zero ±10 millivolts on the dc voltmeter.

Step 3. With the same test connection as in step 2, adjust the attitude gyro or simulator to the right for a reading of 1.1Vac on the ac voltmeter (approximately 23° ±2° of bank angle). Rotate turn command knob for a full right turn (CW) and adjust A1R6 (figure 2-2) for zero ±10 millivolts on the dc voltmeter.

NOTE

Steps 2 and 3 must be accomplished in proper sequence to obtain proper bank angle symmetry.

Step 4. Center turn command knob and push in (engage heading). With the attitude gyro or simulator adjusted as in step 3 monitor ac voltmeter for 1.1Vac. Connect dc voltmeter to TP16 (J2 pin K) reference to TP8 (J1 pin m). Rotate heading selector (CCW) 45° left of the directional gyro heading. Adjust A3R13 (figure 2-2) for a reading of zero ±10 millivolts.

Step 5. Adjust the attitude gyro as in step 2 and monitor ac voltmeter to 1.1Vac. With dc voltmeter connected as in step 4, rotate heading selector (CW) 45° right of the directional gyro heading and adjust A3R14 (figure 2-2) for a reading of zero ±10 millivolts. Return attitude gyro or simulator to wings level position.

Omni Intercept Angle Adjustments.

Place gyro switch on the autopilot control unit to the out position and disconnect the simulator if used.

Step 1. Connect the dc voltmeter and VOR/LOC-GS simulator to the VOR left and right terminals of the autopilot test set and adjust VOR simulator for a reading of 180 millivolts "left." Connect the ac voltmeter to TP23 (J1 pin K) reference to TP8 (J1 pin m) and rotate the heading selector (CCW) 45° left of the directional gyro heading. The VOR/LOC-GS switch must be in the VOR/LOC position and the LOC enable switch in the OUT position on the autopilot test set.

Step 2. Connect the dc voltmeter to TP16 (J2 pin K) with reference to TP8 (J1 pin m) with the signal conditions the same as specified in step 1. Engage NAV switch on the autopilot control unit and adjust A5R13 (figure 2-2) for a reading of zero ±10 millivolts on the dc voltmeter.

Step 3. Connect the dc voltmeter and VOR/LOC-GS simulator on the VOR left and right terminals of the autopilot test set and adjust VOR simulator for a reading of 180 millivolts "right." Connect the ac voltmeter to TP23 (J1 pin K) reference to TP8 (J1 pin m) and rotate the heading selector (CW) 45° right of the directional gyro heading.

Step 4. Connect the dc voltmeter to TP16 (J2 pin K) with reference to TP8 (J1 pin m) with the signal conditions the same as specified in step 1. Adjust A5R14 (figure 2-2) for a reading of zero ±10 millivolts on the dc voltmeter. Return heading selector to the reference heading.

Omni Intercept to Track Switch Adjustments.

Step 1. With Nav mode disengaged, connect the dc voltmeter and VOR/LOC-GS simulator to the VOR left and right terminals of the autopilot test set and adjust VOR simulator for a reading of 30 millivolts "left." The VOR/LOC-GS switch must be in the VOR/LOC position and the LOC enable switch in the OUT position on the autopilot test set.

Step 2. Turn A5R25 (figure 2-2) fully CW. When the potentiometer has reached the limit of travel a low level clicking sound will be heard. Connect the dc voltmeter to TP25 (J3 pin F) reference TP8 (J1 pin m). Engage NAV mode, the reading should be greater than +10V. Slowly

adjust A5R25 (CCW) until the voltage on the dc voltmeter switches to less than 1 volt. Disengage Nav switch on autopilot control unit.

Step 3. With same signal conditions as in step 1, and the dc voltmeter connected as in step 2, increase the omni simulator output greater than 30 millivolts left. Engage Nav switch on autopilot control unit and slowly bring the simulator output back through the 30 millivolt reading. The dc voltmeter should switch from greater than +10 volts to less than 1 volt at approximately the 30 millivolt output from the simulator. If the computer does not switch close to the 30 millivolt output of the omni simulator, readjust A5R25 (CW) or (CCW) as necessary.

Step 4. With NAV mode disengaged, connect the dc voltmeter and VOR/LOC-GS simulator to the VOR left and right terminals of the autopilot test set and adjust VOR simulator for a reading of 30 millivolts "right." The VOR/LOC-GS switch must be in the VOR/LOC position and the LOC enable switch in the OUT position on the autopilot test set.

Step 5. Turn A5R36 (figure 2-2) fully clockwise. When the potentiometer has reached the limit of travel, a low level clicking sound will be heard. Connect the dc voltmeter to TP25 (J3 pin F) reference TP8 (J1 pin m). Engage NAV mode, the reading should be greater than +10 volts. Slowly adjust A5R36 (CCW) until the voltage on the dc voltmeter switches to less than 1 volt. Disengage Nav switch on autopilot control unit.

Step 6. With same signal conditions as in step 1, and the dc voltmeter connected as in step 2, increase the omni simulator output greater than 30 millivolts right. Engage Nav switch on autopilot control unit and slowly bring the simulator output back through the 30 millivolt reading. The dc voltmeter should switch from greater than +10 volts to less than 1 volt at approximately the 30 millivolt output from the simulator. If the computer does not switch close to the 30 millivolt output of the omni simulator, readjust A5R36 (CW) or (CCW) as necessary.

Step 7. With the CA530A computer amplifier connected in the 400A Nav-O-Matic system, engage the NAV function with zero radio and heading error inputs. Set computer to NAV track mode, and short the input to ground at A10E7. Adjust A10R8 (figure 2-2) so that the integrator output measured at pin (6) of A10U1 is changing at a rate less than 5 millivolts per minute.

Glide Slope Coupling Check.

Refer to Section 5, Glide Slope Engage Logic paragraph to determine proper operation.

Step 1. Connect the VOR/LOC-GS simulator to the glide slope up-down terminals on the autopilot test set. Place VOR/LOC-GS switch in the GS position and the LOC enable switch in the IN (up) position and check the GS disable switch is in the OUT position. Connect the dc voltmeter to GS terminals and adjust the GS simulator for a reading of greater than 20 millivolts down. Engage the NAV and ALT hold modes on the autopilot control unit. Adjust GS simulator from 20 millivolts up. The altitude hold should not disengage and the glide slope should not engage.

Step 2. With the same test conditions as in step 1, adjust the GS simulator greater than 30 millivolts up and bring it back through zero. At approximately 0 volts on the voltmeter and simulator, the computer should capture and engage glide slope and disengage altitude hold. The pitch actuator should move toward a pitch down position when the glide slope is captured.

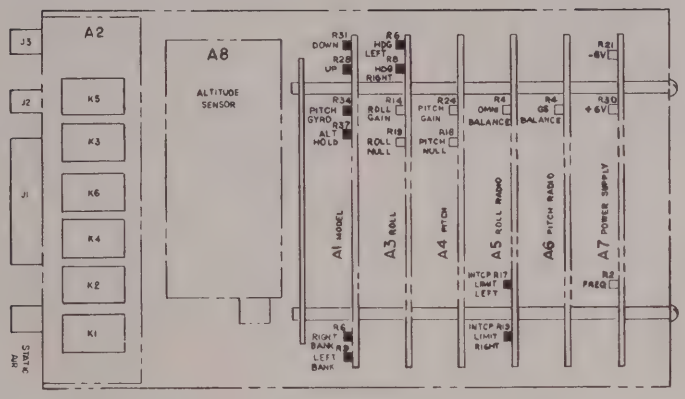
"G"-Switch Operation Check.

The 1270723-1 and -6 G-switch assemblies associated with Nav-O-Matic 400A Autopilots and 300 and 400 IFCS installations in 1974 Model 210's and 337's can be ground checked in the following manner.

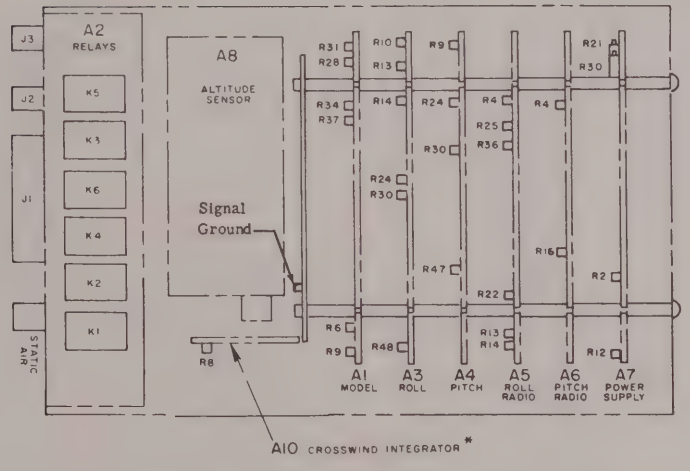
Step 1. Turn on the autopilot by depressing the magnetic latching switch on the autopilot control panel. The latching switch will lock in the on position if the G-switch is mounted in its normal cabin-top (337) or radio shelf (210) position.

Step 2. Actuate the autopilot disengage switch on the pilot's control wheel. The magnetic latching power-on switch on the autopilot control panel will unlatch and turn off the autopilot.

Step 3. Remove the G-switch assembly from its normal mounting and rotate it on its major (horizontal) axis. This causes the rolamite cylinder inside the plastic switch case to move to the opposite end of the plastic housing. The rolamite switch is normally open when the switch assembly is mounted in the airplane. The -6 assembly mounts inside the cabin-top of a Skymaster. The -1 assembly mounts on the radio shelf of a 210 Centurion. Ground wire from #3 terminal must be grounded to the airframe. Connect jumper lead from #3 (center) terminal to airframe ground, as this ground will be broken when G-switch assembly is removed from its mounting. Switch and circuit boards within the enclosure are identical. Orientation within the enclosure are reversed to accomodate cabin-top and radio shelf mounting positions.



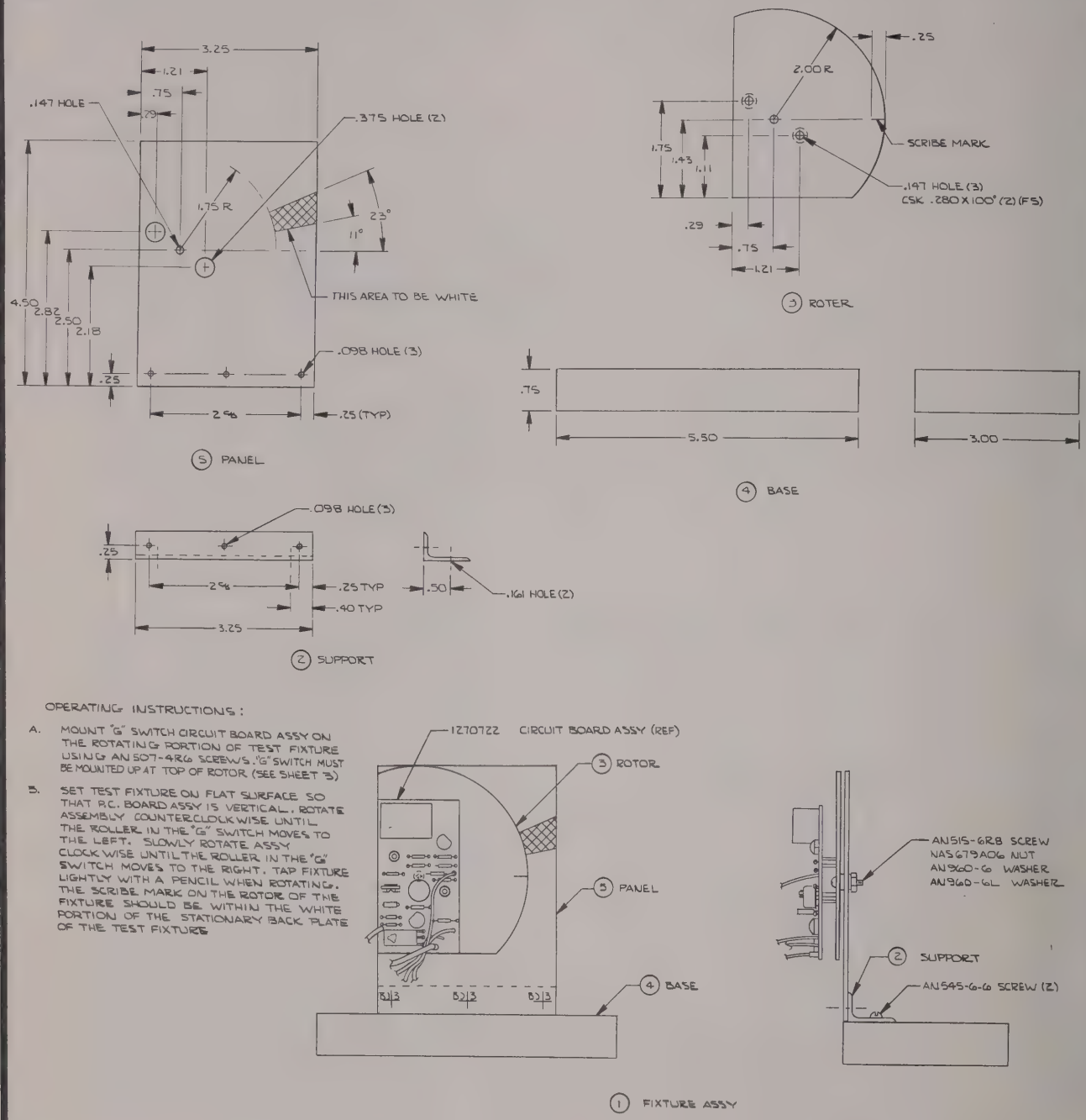
NOTE
Refer to Figure 6-1, Sheet 1 for Serialization



NOTE
Refer to Figure 6-2, Sheet 2 for Serialization

*Existing only in Computer Amplifier P/N 37970-0228, 37970-0328, 379-1228, 37970-1328, 37970-6028 and 37970-7028.

Figure 2-2. CA530A Computer Adjustment Location



INDEX	PART NUMBER	DESCRIPTION	MATERIAL
1	10182-063-1	Fixture Assembly	Not Applicable
2	10182-063-2	Support	Extruded Angle
3	10182-063-3	Rotor	.032-2024-T3 Clad
4	10182-063-4	Base	Wood
5	10182-063-5	Panel	.062-2024-T3 Clad

Figure 2-3. "G" Switch Test Fixture

Step 4. Check G-switch unlatching of the autopilot power-on switch by rotating the switch box about its major axis. The rolamite switch will close but autopilot will not be shut off until some back pressure (nose up) is applied to the control wheel. The G-switch can not shut off the autopilot until the pitch (elevator) actuator is driving in the elevator down direction. Pulling back on the control wheel will cause the autopilot elevator actuator to make an opposing correction, thereby, providing the elevator-down signal necessary for G-switch disengagement of the autopilot.

Step 5. The rolamite switch can be bench checked for calibration limits by rotating it on a simple device constructed per Figure 2-1. This device provides for mounting the entire circuit board and rolamite switch on a rotating disc then slowly rotating the disc clockwise until the rolamite cylinder moves from its open to closed position. The rolamite cylinder will move (contacts close) between 23° and 11° above the horizontal (0°) reference.

2-3. INSTALLATION ADJUSTMENTS.

Actuator Cable Tension.

The actuator cable tensions are different for each type of aircraft. When installing 400A Nav-O-Matic autopilot in aircraft, refer to applicable aircraft service manual for proper cable tension.

Actuator Centering.

When the 400A Nav-O-Matic installation in the aircraft has been completed, the centering control on the actuators must be adjusted before the system is ready for in-flight adjustments. Center the actuators as follows:

Step 1. Set gyro switch on rear of control to OFF.

Step 2. Turn AP ON switch to ON and move aircraft control wheel in pitch and roll positions (if necessary) until both pitch and roll actuators are nulled out or driven to the stop. The pitch axis may require some assistance to overcome aircraft augmented stability system.

NOTE

If system drives to a stop in either axis, turn off autopilot and turn the centering shaft (74, figure 7-1) on the actuator that is in the stop clockwise. Hold in clockwise position and manually move ailerons or elevators to the opposite stop with the control wheel. Release centering screw and repeat step 2.

Step 3. On control unit, center TURN control knob and lateral trim control.

Step 4. Turn autopilot OFF. On the roll actuator, turn the centering shaft (74, figure 7-1) clockwise and hold it in the clockwise position, then manually center the ailerons for level flight.

Step 5. Release centering shaft and turn autopilot ON. The ailerons should remain in the level flight position and the turn control knob and lateral trim control should remain centered.

Step 6. If necessary, repeat steps 4 and 5 until results in step 5 are achieved.

Step 7. With autopilot turned ON, wait until pitch actuator has stopped driving, then adjust pitch command wheel approximately five and one-half turns from either end. (A turn of the wheel is defined as the travel of the visible portion of the wheel from top to bottom or vice versa of the control unit.) This represents the level flight position and zero volt at the wiper of the pitch command control.

Step 8. Turn autopilot OFF. On pitch actuator, turn the centering shaft (74, figure 7-1) clockwise, and hold it in the CW position, then position the elevators for level flight.

NOTE

Centering the elevator is best accomplished by manually lifting the elevator to its level flight position.

Step 9. Release centering shaft while holding elevators in level flight position, then turn autopilot on. The pitch command wheel of the control unit should not move more than 1/4 turn.

Step 10. If necessary, repeat steps 8 and 9 until result in step 9 is achieved.

Step 11. Turn autopilot OFF and set gyro switch on back of control unit to ON or IN position.

2-4. POSTINSTALLATION CHECK.

When the 400A Nav-O-Matic has been installed in the aircraft, operation should be checked as follows:

Step 1. Set operating controls on control unit as follows:

AP ON Switch	Off
PULL TURN Control	Pulled out, in detent
TRIM Control	Centered
NAV Switch	Off
ALT Switch	Off
GYRO Switch (on rear of unit)	Out

Step 2. Turn on aircraft master switch. Manually position ailerons for level flight. Place AP ON switch in on position.

Step 3. If ailerons move when autopilot switch is on, by trial and error, set TRIM control to position where ailerons will not move when switch is placed in ON position. Depending on temperature and condition of aileron cables the optimum position of the TRIM control may be slightly off center.

Step 4. Rotate PULL TURN control to R; right aileron should move up.

Step 5. Rotate PULL TURN control to L; right aileron should move down.

Step 6. Center PULL TURN control; ailerons should return to neutral.

Step 7. Set directional gyro to indicate a heading of 0° and set heading selector index to 0° using HDG knob. Push in PULL TURN control; ailerons should remain in neutral.

Step 8. Rotate heading selector index on directional gyro to 30°; right aileron should move up.

Step 9. Set directional gyro to indicate a heading of 30°; ailerons should return to neutral.

Step 10. Override autopilot by turning control wheel to the full left position and then releasing. Control wheel should return to neutral. Repeat test to full right position.

NOTE

On some aircraft, ailerons may not return to level flight attitude if control wheel is deflected to full left position. This is due to the variation in control system rigging permitting the follow-up potentiometer of the actuator to be rotated more than 180 degrees. By slightly turning control wheel toward neutral, the actuator will return the ailerons to level flight position. This condition cannot occur in flight due to air loads.

Step 11. Pull PULL TURN control out and leave in detent.

Step 12. Rotate pitch command wheel toward DWN. Elevators should move down and manual pitch trim control should move while elevators are in motion.

NOTE

While performing this check, manually exert sufficient force on the control wheel to hold the elevators in a neutral position. As the actuator is engaged, reduce the force enough to permit the actuator to control the elevator.

Step 13. Rotate pitch command wheel toward UP while applying a slight helping force to control wheel. Elevators should move up and the manual pitch trim control should move while the elevators are in motion.

Step 14. Center pitch command wheel. Elevators should move to neutral and manual pitch trim control should move to neutral.

Step 15. Lower flaps 15°. The aircraft control wheel should move in a "pitch down" direction.

Step 16. Return flaps to 0°; control wheel should return to original position.

NOTE

The flap position potentiometer output with the computer connected should be 25 $\pm$15 millivolts when the flaps are up and should increase to more than 8 Vdc when the flaps are fully extended.

Step 17. Place AP ON switch in OFF position.

Step 18. Check control wheel for full travel, left and right, forward and rearward.

Step 19. Set gyro switch on back of control unit to ON or IN position prior to flight.

2-5. INFLIGHT ADJUSTMENTS.

General. When postinstallation check has been completed, the following adjustments must be made with the aircraft airborne, before the autopilot is ready for flight testing. These adjustment controls are located in the computer-amplifier and may be adjusted through the holes in the top of the dust cover with the adjustment hole cover removed.

Pitch Gyro Sensitivity.

NOTE

Do not perform pitch gyro sensitivity adjustment procedures inflight unless aircraft is loaded in AFT gross configuration. Bench alignment adjustments should be sufficient.

Step 1. Turn on autopilot and establish aircraft in level flight.

Step 2. A displacement of elevators by pulsing control wheel should result in no more than a 1-1/2 cycle, pitch oscillation and no jitter.

Step 3. If conditions in step 2 are not present, adjust PITCH GYRO SENS adjustment (A1R34, figure 2-2) until conditions in step 2 are obtained.

NOTE

If aircraft is "porpoising" about the pitch axis, adjustment of pitch gyro sensitivity may be necessary.

Pitch Gain Up (Pitch Command Max Up).

Step 1. Establish aircraft in METO power climb with pitch command full UP.

Step 2. Aircraft should reach a speed of 20 MPH below best rate of climb speed.

Step 3. If conditions of step 2 cannot be achieved, adjust PITCH GAIN UP adjustment (A1R28, figure 2-2) until this condition is obtained.

Pitch Gain Down (Pitch Command Max Down).

Step 1. With forward loading, aircraft power at bottom of the green, and pitch command full DWN, aircraft should reach autopilot limit speed (+0, -10 MPH). (Autopilot limit speeds for particular aircraft are available in Autopilot Checklist and Flight Manual).

Step 2. If conditions of step 1 cannot be achieved, adjust PITCH GAIN DWN adjustment (A1R31, figure 2-2) until this condition is obtained.

Bank Angle Left.

Step 1. Trim aircraft and set for level flight at cruise speed.

Step 2. With PULL TURN control pulled out, rotate control fully counterclockwise to stop. Aircraft should turn left and establish a bank angle between 21° and 25°.

Step 3. If condition of step 2 cannot be achieved, adjust BANK ANGLE LEFT (A1R9, figure 2-2) until this condition is obtained.

Bank Angle Right.

Step 1. Trim aircraft and set for level flight at cruise speed.

Step 2. With PULL TURN control pulled out, rotate control fully clockwise to stop. Aircraft should turn right and establish a bank angle between 21° and 25°.

Step 3. If condition of step 2 cannot be achieved, adjust BANK ANGLE RIGHT (A1R6, figure 2-2) until this condition is obtained.

NOTE

Bank angle symmetry should be within 4°.

Heading Bank Angle Adjustment.

Step 1. Trim aircraft and set for level flight at cruise speed.

Step 2. Engage heading mode by pushing in PULL TURN control.

Step 3. Set heading selector index on directional gyro to a heading which is at least 90° clockwise from aircraft heading. Aircraft should turn right to intercept selected heading; bank angle should be between 21° and 25°.

Step 4. If condition of step 3 cannot be achieved, adjust HDG LIMIT RIGHT (A3R14, figure 2-2) until this condition is obtained. Maintain heading change for more than 60° during adjustment to ensure that the bank angle is at maximum value.

Step 5. Allow aircraft to turn to selected heading (neutral position). Aircraft should roll out of turn smoothly within 10 seconds.

Step 6. Select heading which is at least 90° counterclockwise from aircraft heading. Aircraft should turn to left to intercept selected heading; bank angle should be between 21° and 25°.

Step 7. If condition of step 6 cannot be achieved, adjust HDG LIMIT LEFT (A1R13, figure 2-2) until this condition is obtained. Maintain heading change for more than 60° during adjustment to ensure that bank angle is at maximum value.

Step 8. Allow aircraft to turn to selected heading (neutral position). Aircraft should roll out of turn smoothly within 10 seconds.

Omni Intercept Angle Adjustment.

Step 1. After heading bank angle has been adjusted, select VOR station on navigation receiver which is 15 to 25 miles away.

Step 2. On omni bearing selector (OBS), select radial which is 10° to left of radial on which aircraft is flying.

Step 3. When Nav course datum is not used, set heading selector index on directional gyro to same heading as OBS.

Step 4. Push in PULL TURN control and engage NAV switch. Aircraft should bank, roll out, and set up intercept angle.

Step 5. When aircraft has established intercept angle and is in level flight, adjust OMNI INTCP RIGHT (A5R14, figure 2-2) as necessary to obtain intercept angle of 43° to 46° with full scale omni deviation needle deflection.

Step 6. When omni radial has been intercepted set OBS 10° to right.

Step 7. Set heading selector index to same heading as OBS, and reset omni intercept function by disengaging and re-engaging NAV switch. Aircraft should bank, roll out, and set up intercept angle.

Step 8. When aircraft has established intercept angle and is in level flight, adjust OMNI INTCP LEFT (A5R13, figure 2-2) as necessary to obtain intercept angle of 43° to 46° with full scale omni deviation deflection.

Altitude Hold.

Establish best rate of climb for particular aircraft using pitch command wheel. Engage ALT switch. The aircraft should return to the level flight position within 6 to 12 seconds and reach the selected altitude within 25 seconds. If necessary, adjust ALT HOLD adjustment (A1R37, figure 2-2) to achieve this result.

Perform normal autopilot flight check.

SECTION III

Operation

3-1. OPERATING CONTROLS.

Except for the heading selector, which is located remotely on the instrument panel, all operating controls for the 400A Nav-O-Matic are located on the control unit. The operating controls are shown in figure 3-1 and listed in Table 3-1.

3-2. AUTOPILOT PREFLIGHT CHECK.

Before operating the autopilot in the air, the system should be ground-checked as follows:

Step 1. Start aircraft engines and set 400A Nav-O-Matic operating controls as follows: on-off switch to ON; pitch command wheel centered; lateral trim control centered; altitude engage and navigation engage switches to off; heading selector to same heading as shown on the directional gyro.

Step 2. Rotate TURN COMMAND knob to full right and note aileron response. Then rotate the knob full left. Aircraft control wheels should rotate in direction of turn and then slowly return to a setting part way back to level flight attitude. Center TURN COMMAND knob.

Step 3. Override actuator by manually turning control wheel to left and then to right. When the wheel is released in either position, the wheel should return to level flight position.

NOTE

On some aircraft, ailerons may not return to level flight attitude if control wheel is deflected to full left position. This is due to the variation in control system rigging which allows the follow-up potentiometer in the actuator to be rotated more than 180 degrees. By turning control wheel slightly toward neutral, the actuator will return the ailerons to level flight position. This condition cannot occur in flight, due to air loads.

Step 4. Check that heading selector is set to agree with heading indicated on directional gyro. Then center TURN COMMAND knob in detent and push it in to engage heading lock.

Step 5. Turn heading selector to right. Aircraft wheel should turn right.

Step 6. Turn heading selector to left. Aircraft control wheel should turn left.

Step 7. With heading selector still in left position, reset directional gyro heading to agree with heading shown on heading selector. Control wheel should return to level flight position.

Step 8. Pull TURN COMMAND knob out and leave it in detent.

Step 9. Rotate pitch command wheel toward DWN. Elevators should move down and manual pitch trim control should move while elevators are in motion.

NOTE

While performing this check, manually exert a small amount of pressure on the control wheel to hold the elevators in a neutral position. As the actuator is engaged, reduce the pressure enough to permit the actuator to control the elevator.

Step 10. Rotate pitch command wheel toward UP while applying a slight helping pressure to control wheel. Elevators should move up and the manual lateral trim control should move while the elevators are in motion.

Step 11. Center pitch command wheel. Elevators should move to neutral and manual lateral trim control should null out.

Step 12. Drop flaps 15°. The aircraft control wheel should move in a "pitch down" direction.

Step 13. Return flaps to neutral; control wheel should return to original position.

Step 14. Turn AP ON switch to off and check aircraft control wheel for free movement.

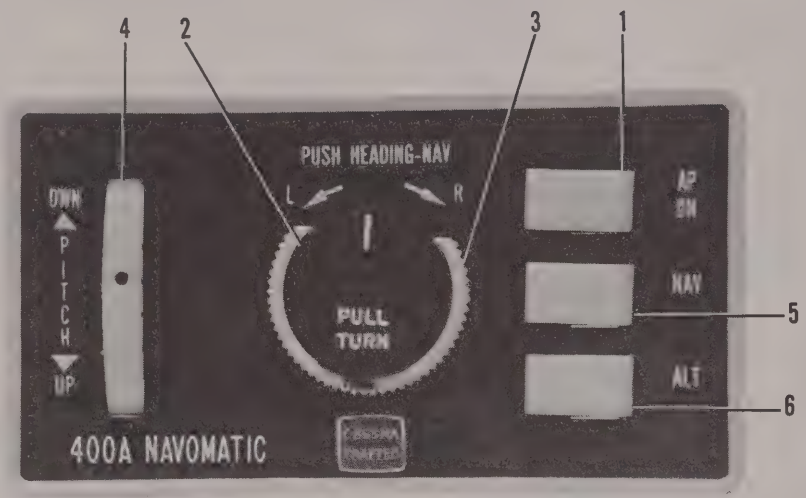
3-3. AUTOPILOT IN FLIGHT OPERATION.

WARNING

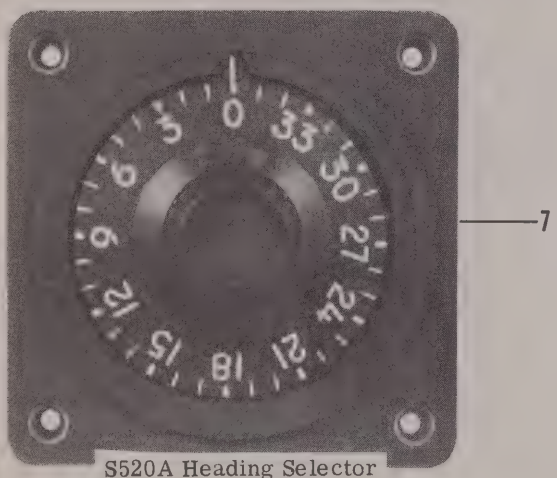
Do not operate 400A Nav-O-Matic during airspeeds greater than placarded values.

Takeoff and Autopilot Engage.

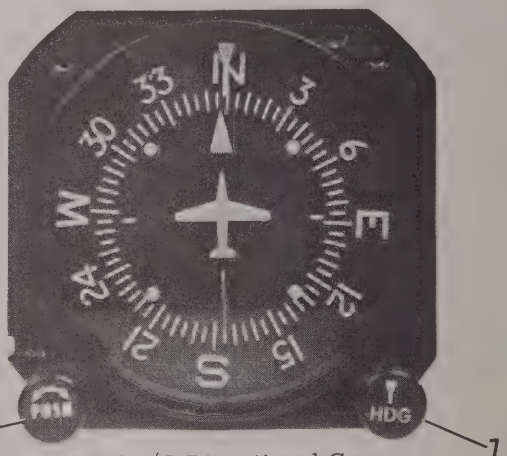
Before takeoff, make sure AP ON switch is set to off. The autopilot may be engaged at any time after the



C530A Control Unit

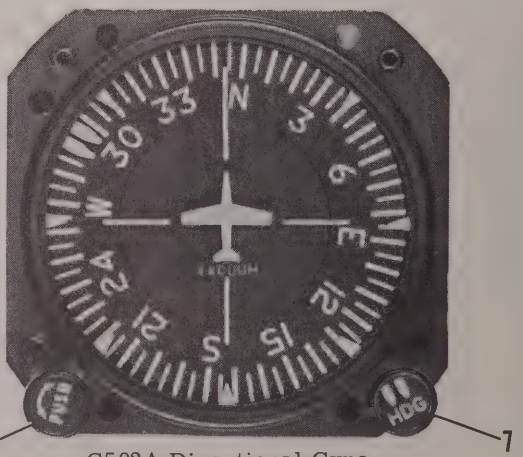


S520A Heading Selector



G502B/C Directional Gyro

G520A Directional Gyro



G502A Directional Gyro

Figure 3-1. Operating Controls

TABLE 3-1. OPERATING CONTROLS

Figure 3-1 Item No.	Designation	Control	Function
1	AP ON	Autopilot ON-OFF switch.	Controls primary power to 400A Nav-O-Matic.
2	PUSH HEADING-NAV PULL TURN COMMAND L-R	Functional switch and turn command control.	When knob is in detent and pushed in, enables autopilot to intercept and hold selected heading or VOR radial. When knob is pulled out and rotated allows aircraft to be banked right (R) or left (L).
3	TRIM	Lateral trim control.	When TURN COMMAND knob is pulled out and in detent, control is used to trim aircraft for wing level attitude.
4	PITCH-DWN-UP	Pitch command wheel.	Controls up or down movement of elevators to establish pitch attitude of aircraft. (Control is engaged in altitude hold and approach modes of operation of autopilot.)
5	NAV	Navigation engage switch.	Selects automatic VOR radial or localizer intercept and tracking operation. Switch 2 must be pushed in.
6	ALT	Altitude hold engage switch.	Selects automatic altitude hold operation.
7	SEL	Heading selector	Selects desired magnetic heading or VOR radial.
8	DIRECTIONAL GYRO	Gyro Calibration Control	Allows pilot to set gyro to correspond with A/C heading.

aircraft is airborne; however, before engaging, have aircraft manually trimmed for climb, set heading selector to desired heading, and have TURN COMMAND knob centered and pushed in for heading information. The automatic pitch trim system (part of the 400A Nav-O-Matic) will continually trim aircraft to assure in-trim condition whenever autopilot is engaged.

Climb-Out.

The 400A Nav-O-Matic may be used for climb-out control as follows:

Step 1. After takeoff, climb to approximately 200 feet with aircraft power and elevator trim adjusted for desired climb attitude.

Step 2. Pull out TURN COMMAND knob and leave it in detent.

Step 3. Set AP ON switch to ON.

Step 4. If necessary, adjust manual lateral trim control for wing level attitude.

Cruise Engagement.

The 400A Nav-O-Matic may be used for on-course flight as follows:

Step 1. Manually trim aircraft for straight and level flight.

Step 2. Pull out TURN COMMAND knob and leave it centered, then set A/P ON switch to "ON."

Step 3. If necessary adjust manual lateral trim control.

Maneuvering

When autopilot is engaged, all normal maneuvers can be performed. The PITCH wheel will smoothly command pitch responses through 15° up or down, and the TURN knob will provide bank angles up to 23°. Manual override permits overriding of autopilot whenever necessary without disengaging autopilot. On release, aircraft will return smoothly to condition commanded by autopilot. To climb, descend, or make command turns using 400A Nav-O-Matic, proceed as follows:

Step 1. With autopilot engaged, rotate pitch command wheel UP. Pitch angle and resulting rate of climb can be controlled by varying position of pitch command wheel. If necessary, increase power setting to maintain desired rate of climb.

Step 2. For level flight, return pitch command wheel to center position.

Step 3. To descend, rotate pitch command wheel DWN. Reduce power setting as necessary to maintain desired speed and rate of descent.

Step 4. Return pitch command wheel to center position for level flight.

Step 5. To perform command turns, pull out TURN COMMAND knob. Turn knob toward L to initiate a left turn, or toward R to initiate a right turn.

NOTE

When the knob is rotated as far as it will go, either left or right, the aircraft will make an approximate standard rate turn. Verify standard rate turn by the clock. Turn rate (bank angle) can be regulated by varying the position of the turn control.

Step 6. Rotate TURN COMMAND knob to center position to return to level flight. Push TURN COMMAND knob in to regain heading function, or push TURN COMMAND knob in and re-engage NAV switch to regain omni function.

Emergency Operation.

If a power failure occurs in the 400A Nav-O-Matic, a monitor circuit in the control unit automatically turns off the autopilot. If any other malfunction occurs in the 400A Nav-O-Matic, the autopilot can be easily overpowered with pressure on the manual flight controls. The autopilot should be disengaged by turning the AP ON switch off. A G-switch has been incorporated into the 400A Nav-O-Matic installations in the Models 210 and 337. This switch will automatically disengage the autopilot if a sustained downward pitching action results in a near zero "g" condition. Therefore, if it is observed that zero "g" is being encountered (during maneuvering or a malfunction) without an automatic disengagement, or if

disengagements are too common in normal autopilot usage, the G-switch circuitry is not working properly. In this event, it should be checked in accordance with the procedures in Section 2.

Heading and Altitude Hold Operation.

To use the 400A Nav-O-Matic for heading hold and altitude hold operation, perform cruise engagement procedures and then proceed as follows:

Step 1. Set heading select for desired heading.

Step 2. Center TURN COMMAND knob and push it in. Aircraft should turn sharply to intercept selected heading. The autopilot will maintain whatever heading is set into the heading selector.

NOTE

Bank angle should not exceed 25°±2, and heading selected should be within 170°, if making heading turn to selected heading.

Step 3. Check precession of directional gyro against magnetic compass; reset gyro as necessary.

NOTE

If aircraft assumes heading slightly different from selected heading, one of the two following conditions probably exist:

1. Aircraft is out of trim.
2. Directional gyro heading is not set exactly on desired course. To correct, pull out TURN COMMAND knob, level wings with manual lateral trim control, and finely adjust directional gyro heading.

Step 4. For altitude hold operation, when desired altitude is reached, engage altitude engage switch. If aircraft is in climb or descent attitude, it may overshoot but will return smoothly to selected altitude and aircraft will be automatically trimmed for level flight.

NOTE

When sensor error is greater than 30 feet from the selected altitude at initial autopilot engagement, an interlock circuit prevents engagement of altitude hold operation.

Automatic Omni Navigation.

The automatic omni coupler enables the 400A Nav-O-Matic to intercept and track any suitable omni within range of the navigation receiver. To fly the omni, proceed as follows:

Step 1. Pull out TURN COMMAND knob and leave it in detent.

Step 2. On navigation set, tune to desired omni station and on OBS select course to be flown.

Step 3. Set heading selector to same heading as that shown on OBS.

Step 4. Push TURN COMMAND knob in and engage navigation engage switch. Aircraft will intercept the selected VOR radial and compute for necessary wind correction.

NOTE

For best operation, the omni function should be engaged when the aircraft is flying within 30° of the selected omni bearing. On 1972 and 1973 production units the omni coupler compensates for crosswinds up to approximately 10° crab angle. On 1974 and on production units the crosswind integrator will correct for a crab angle up to 25°. However, extremely high crosswinds may result in a slight deflection off center of the omni course deviation pointer. If necessary, set the selector to 5° into the wind for additional compensation. If this value is insufficient, increase the setting 5° more.

On passing station, over-station limiter will restrict bank to 10° and heading change to ±15°. This prevents large excursions caused by station cone of confusion.

Step 5. If outbound heading from omni station is to be the same as the inbound heading, the navigation switch may be left engaged while overflying the omni station. If outbound heading is to be different, accomplish Steps 1 through 4 for new heading just prior to station passage.

Step 6. To change course, pull out TURN COMMAND knob, select new heading on OBS and turn heading selector control to new heading.

Step 7. Push in TURN COMMAND knob and reengage navigation engage switch

NOTE

When TURN COMMAND knob is pulled out, navigation engage switch is automatically disengaged.

Automatic ILS Approaches.

To make automatic ILS approaches using the 400A Nav-O-Matic, see figure 3-2 and proceed as follows:

Step 1. Fly the outbound leg of the designated approach in heading mode.

Step 2. Reduce airspeed to approach speed and adjust flaps to 15°.

Step 3. Execute procedure turn using turn command.

Step 4. Turning inbound on procedure turn, turn heading select indicator to inbound heading of localizer.

Step 5. As localizer needle leaves peg, push in TURN COMMAND knob and engage NAV switch.

Step 6. If a front course approach is being conducted, the glide slope will be automatically coupled as the glide slope needle passes center. This will also disengage the altitude hold and decrease the maximum available bank angle from 23° to 10° for smoother bracketing.

Step 7. Lower landing gear and maintain approach speeds in accordance with Autopilot Checklist.

3-4. OPERATING PRECAUTIONS.

a. For most efficient performance, periodically check that aircraft trim and autopilot trim are coordinated so that the ball is centered in the turn-and-bank indicator. Always check to be sure that TURN COMMAND knob is pulled out and in detent when adjusting (manual) lateral trim control on the autopilot.

b. The autopilot may be overpowered at any time; however, this practice should be kept to a maximum since slip-clutch wear will result from extended periods of manual overpower.

c. The autopilot should not be engaged during take-off and landing. Although the system can be overpowered easily, servo forces could significantly alter the manual "feel" of the aircraft controls. While in flight, the autopilot may be engaged in any attitude and at any heading to bring the aircraft smoothly to level flight at the desired heading.

d. The autopilot does not require a warm-up period since it is transistorized and the directional and attitude gyros used in the system are vacuum operated or use transistors. The gyros will reach operating speed in 3-5 minutes after the engine has been started. The roll control becomes effective immediately after the AP ON switch has been turned ON and the pitch control takes hold after synchronization.

e. Depending upon position and heading of the aircraft at time omni coupler is engaged, the aircraft may be expected to make a standard rate turn toward the omni course deviation pointer, and roll out on an intercept angle or 40° to 50° to the selected radial. Just as the omni pointer moves from full deflection (approximately 10°), the aircraft will start to make a slow rate turn to intercept the selected radial on the intended heading.

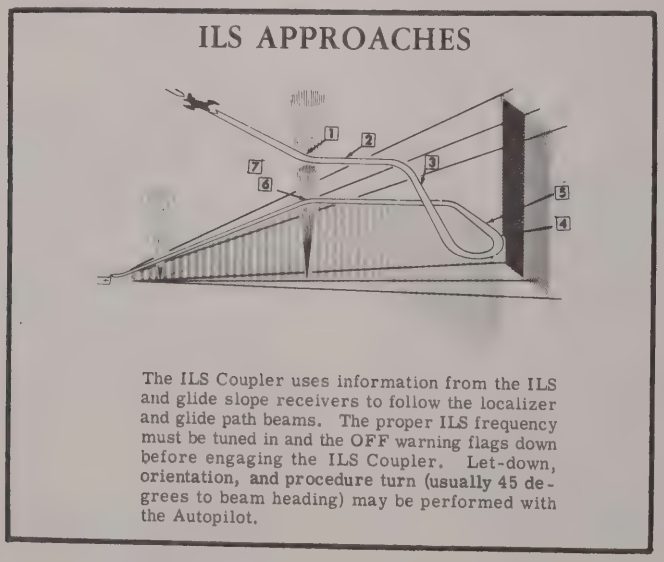


Figure 3-2. ILS Approaches

SECTION IV

Principles of Operation

4-1. BASIC PRINCIPLES OF OPERATION.

General.

A simplified functional diagram of the major components of the 400A Nav-O-Matic is shown in Figure 4-1. The attitude gyro is used to sense changes in the roll or pitch attitude of the aircraft. A change in either of these attitudes from straight and level flight is translated into an error signal by the computer amplifier. If an error signal is the result of roll, the roll actuator positions the ailerons to correct the error. If an error is the result of pitch, the pitch actuator positions the elevators to correct the error. If error signals from the roll and pitch attitudes are simultaneous, both actuators will operate at once. With the ailerons in the position necessary to correct a roll error, a feedback voltage, equal in magnitude and opposite in polarity to the error voltage, causes the roll actuator to stop. As the roll angle corrects toward straight and level flight, the error signal decreases, the feedback signal, which was previously equal to the error signal, causes the roll actuator to drive the ailerons toward their neutral position. The aircraft flies smoothly into the desired attitude with the feedback signal continuously reducing the aileron angle as the attitude error decreases.

With the addition of the automatic pitch trim system, the method of correcting errors in the pitch attitude is similar to that used for correcting roll errors.

Engagement of Autopilot.

When the control unit AP ON switch is switched on, low voltage is applied to the electromagnetic clutch solenoids in the roll and pitch actuators thereby engaging the actuators to the flight controls. The pitch actuator clutch will not energize until the pitch control of the autopilot has synchronized with the aircraft pitch attitude. The actuators are mechanically connected to the aileron and elevator control cables through their output sprockets and chains. Any motion of the servomotors will move the control surfaces, which in turn, will affect the attitude of the aircraft. See Figure 4-2 and 4-3. With the aircraft manually trimmed for straight and level flight, the PULL TURN control pulled out and centered, the PITCH control synchronized and the ALT switch off, the error signal outputs from the roll and pitch summing amplifiers are zero. Therefore, no dc input voltages are applied to the servomotors of the actuators, and the actucators, and the actuators are at rest.

Roll Hold.

If a wind gust causes the aircraft to roll, the attitude gyro provides an output signal proportional to the deflection of the gyro gimbal from its position during straight and level flight.

An inductive pickoff with one primary and one split secondary winding is mounted adjacent to the gimbal. A movable element attached to the gimbal controls coupling between the primary and secondary windings of the pickoff. When the aircraft is in straight and level flight, coupling between the primary and both secondary windings is equal. If the aircraft rolls, a corresponding deflection of the gimbal will result. This deflection causes a motion of the pickoff element which alters coupling between the primary and secondary windings. Increased coupling between the primary and one secondary winding and decreased coupling between the primary and other secondary winding cause a voltage to appear at the secondary winding output. The phase of this voltage depends on the direction of the roll; the magnitude is proportional to the roll angle.

As shown in Figure 4-2, with the aircraft in a bank, the output of the roll pickoff (roll error signal) is demodulated and summed through the roll amplifier. The sensitivity control is adjusted to a roll demodulated, voltage output representing approximately 23-degree bank angle. The roll summing amplifier compares the roll error signal with the command signal. The composite signal is amplified and coupled to a DC amplifier. The amplifier output is applied to the roll actuator servo motor which repositions the ailerons.

A follow-up potentiometer in the roll actuator is also repositioned in response to motion of the servo motor. The output of this potentiometer is a dc voltage representing aileron position and is always equal in magnitude to the displacement. This follow-up voltage serves to tell the computer amplifier when the aileron is in the desired position by nulling out the error voltage. The aileron, therefore, assumes some position which is directly related to the magnitude and polarity of the error voltage.

The turn control (PUSH HEADING NAV), mounted on the front panel of the control unit, permits roll control of the aircraft with the autopilot engaged. Movement of this control introduces command signal to the roll summing amplifier. This command signal establishes a new reference attitude for the aircraft in roll and at the same time initiates motion of the roll actuator servo motor and a corresponding motion of the feedback potentiometer to move the aircraft to the new neutral position.

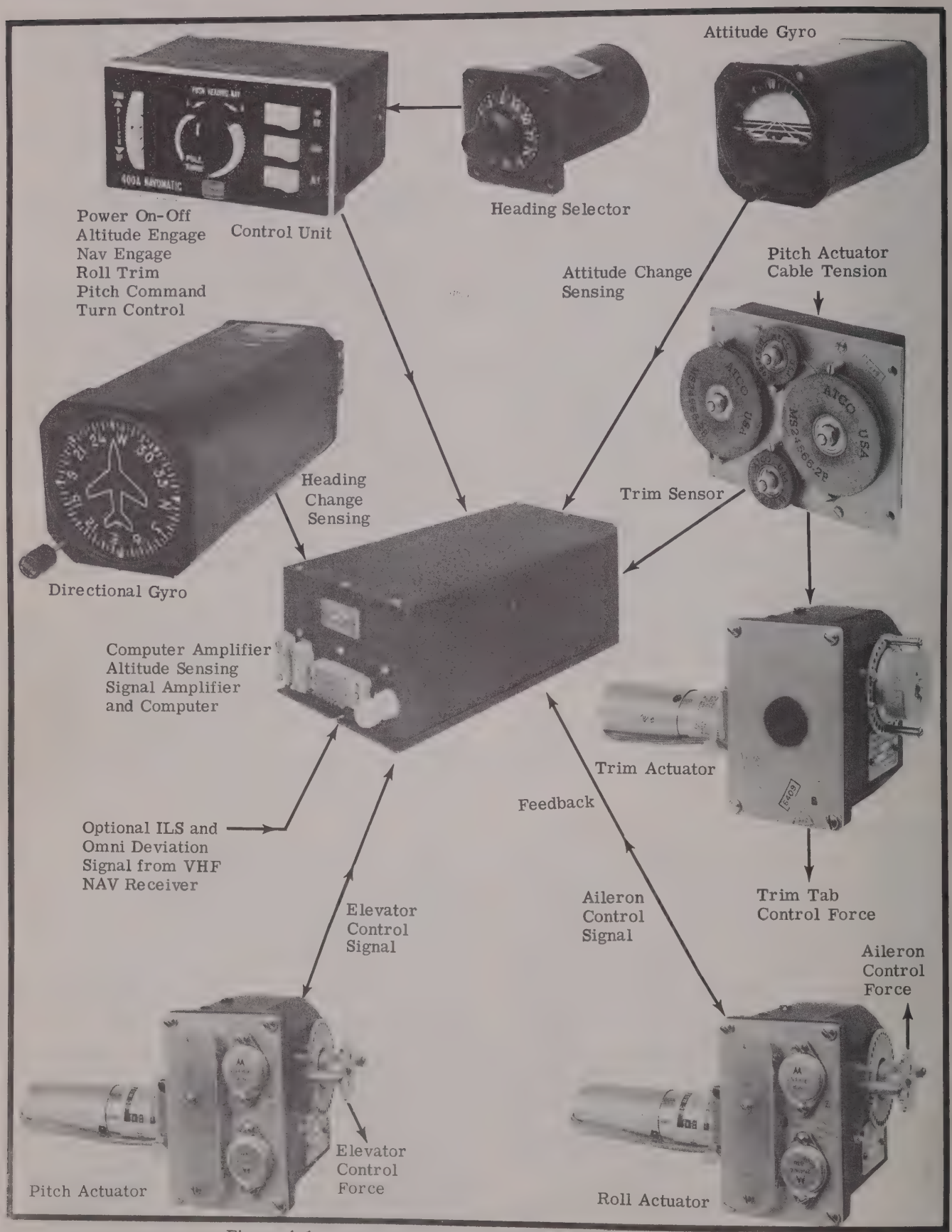


Figure 4-1. Simplified Functional Diagram and Components of the 400A Nav-O-Matic Autopilot

Heading Intercept and Hold.

When the control unit turn control is centered and pushed in, the heading intercept and hold circuits are energized. When the directional gyro indicates that the aircraft is on the heading selected by the selector knob, there is a zero signal output from the heading selector synchro. When the aircraft is not on the selected heading, the output signal from the heading selector synchro is proportional to the amount of deviation from the selected heading. The relative phase of this signal depends on the direction of deviation. The output from the heading selector synchro is demodulated by the heading demodulator and then limited to provide corrective action no greater than a standard rate turn. The resulting heading-deviation voltage is coupled to the roll summing amplifier which interprets this signal as an error and causes the roll servo motor to bank the aircraft, establishing a new aircraft attitude. An asymmetric attitude is maintained until the aircraft is on the selected heading. With the aircraft on the selected heading, the heading-deviation voltage is zero. The heading hold circuits then function to return the aircraft to straight and level flight.

Omni Heading Intercept and Track.

When the control unit turn control is centered and pushed in and the NAV engage switch is engaged, the omni heading intercept circuits of the autopilot are connected. With the heading selector and the VOR course selector set to the desired heading, any deviation from that selected course is interpreted as an error. The resulting signal is amplified, demodulated, and combined with the amplified heading demodulated signal. The combined signal is limited to provide a corrective action with a bank angle no greater than 25°.

The resulting heading-deviation voltage is coupled to the roll summing amplifier which provides a signal to establish a new aircraft attitude. The asymmetric attitude is maintained until the aircraft is on the selected omni radial and heading. When the aircraft is within 2° of the selected omni radial and within 23° $\pm$ 2° of the selected heading, the resulting signal automatically triggers the circuit to a TRACK mode. This mode limits the roll attitude of the aircraft for overstation passage. The circuit will remain in the track mode until the NAV switch is disengaged and then re-engaged at which time the circuit is switched to the intercept mode.

When the aircraft is on the selected course, the heading omni deviation voltage is zero resulting in straight and level flight.

Crosswind Compensation.

All 400A Nav-O-Matic Autopilots have a crosswind compensation network which automatically adjusts the aircraft heading up to crab angles of 15° in the VOR track mode.

Autopilots which have computer amplifiers containing the crosswind integrator (see Figure 6-3A) provide additional crosswind compensation up to crab angles of 25°. When strong crosswinds are encountered while tracking a VOR or localizer, the heading error (crab angle) that is required to maintain tracking along the selected course causes an offset. When an offset of more than one dot (30 microamperes) is encountered the integrator produces an output that is proportional to the radio error and the length of time that the error exists. This signal cancels the effect of the heading error and allows tracking to within one dot.

When the navigation function is selected with the heading error less than 25° and the radio error less than one dot, point A10E6 in the base circuit of A10Q2 is grounded by A5CR9 through contacts A2K5-9 and A2K5-10 of the NAV relay. This causes A10Q2 to stop conducting and allows the gate of A10Q1 to go positive. This turns A10Q1 off and allows the integrating capacitor A10C1 to charge. The output of the integrator appears at A10E3 where it is applied to the roll summing amplifier. The polarity of this signal is such as to oppose the heading error signal. Q3 and Q4 limit the operation of the integrator when the radio error is greater than one dot.

Pitch Hold.

With the exception of the pitch attitude sensing engage circuit, the pitch hold is similar to, and works the same as the roll hold. The PITCH control, mounted on the control unit, permits control of the aircraft pitch attitude with the autopilot engaged. See Figure 4-3.

The pitch attitude hold system is similar in design and operation to the roll attitude hold system except for the addition of the pitch attitude sensing engage circuit.

Pitch information from an inductive pickoff, mounted on the pitch axis of the attitude gyro, is connected through a demodulator to a summing network at the input of the pitch summing amplifier. The outputs from the pitch follow-up potentiometer and the altitude hold circuitry are also applied to the summing network.

When the autopilot is first turned on the pitch attitude sensing engage circuit synchronizes the pitch command wheel with the attitude gyro and pitch follow-up potentiometer signals so that the resulting sum is zero. At this moment a circuit is triggered which permits the pitch actuator clutch to be engaged.

Altitude Hold.

The altitude sensor mechanism, contained in the computer amplifier, consists of a capsule, an air reservoir, a motor-generator, lamp, aperture, and a light sensing cell. A change in air pressure causes the aneroid capsule to expand or contract which in turn moves the aperture so that light falling on a balanced resistance bridge light cell unbalances the circuit. The resulting voltage is amplified which rotates the motor in the sensor to recenter the aperture. This action is continuous until the ALT switch is engaged. Engagement switches switches the circuit from motor to the pitch summing point. Any deviations from the selected altitude therupon result in action similar to pitch hold. Altitude deviations which may result over a period of time are integrated and amplified resulting in the rotation of the PITCH control in the control unit until the summing voltage is zero. A protective circuit in altitude hold prevents engagement until the aperture is synchronized with the actual altitude of the aircraft within ±6 feet.

ILS Approach

When the navigation receiver is switched to a LOCALIZER frequency the autopilot is also switched to the approach mode. With the control unit, turn control in the pushed in position, NAV switch engaged and heading selector turned to the proper heading, the intercept and hold circuits are energized. Action in roll is identical to omni heading intercept. The pitch circuit is armed but will not trigger until the glide slope signal is zero and approached from underneath. When the glide slope triggers altitude hold is automatically disengaged, the sensitivity of the roll circuit is increased, the bank angle is limited to 12°, and a pitch down command is actuated. Deviation from the glide path are integrated, amplified and demodulated resulting in the change of the pitch attitude until the glide slope deviation signal is zero.

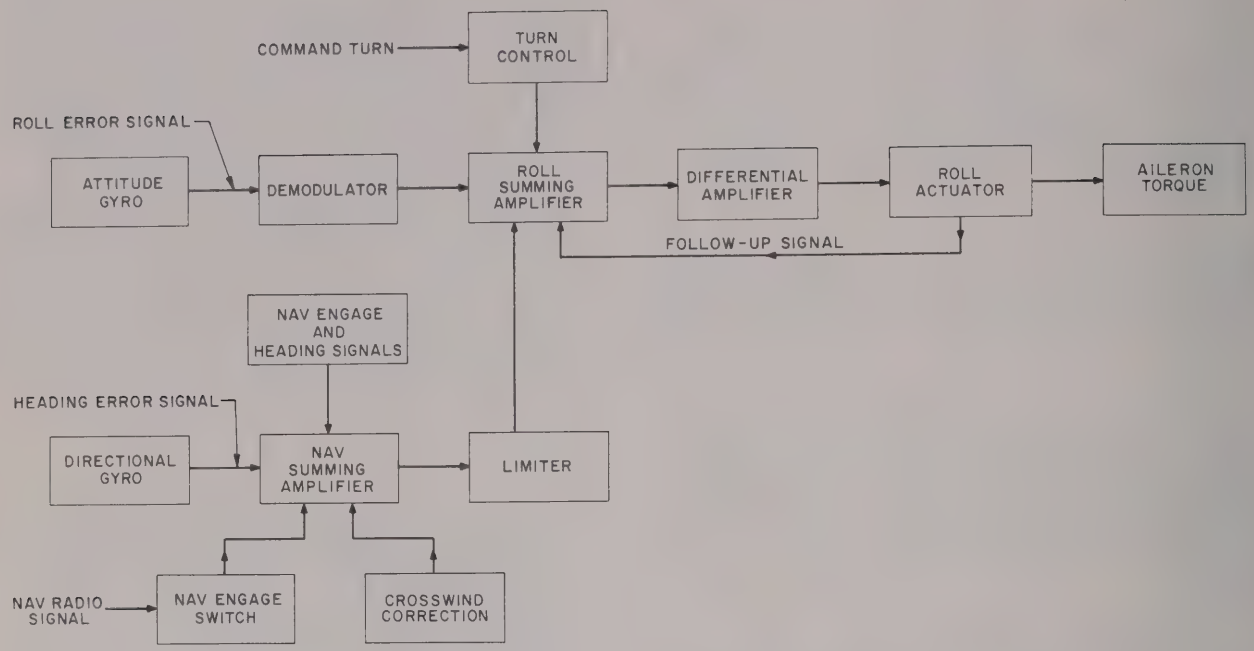


Figure 4-2. Roll Channel Block Diagram

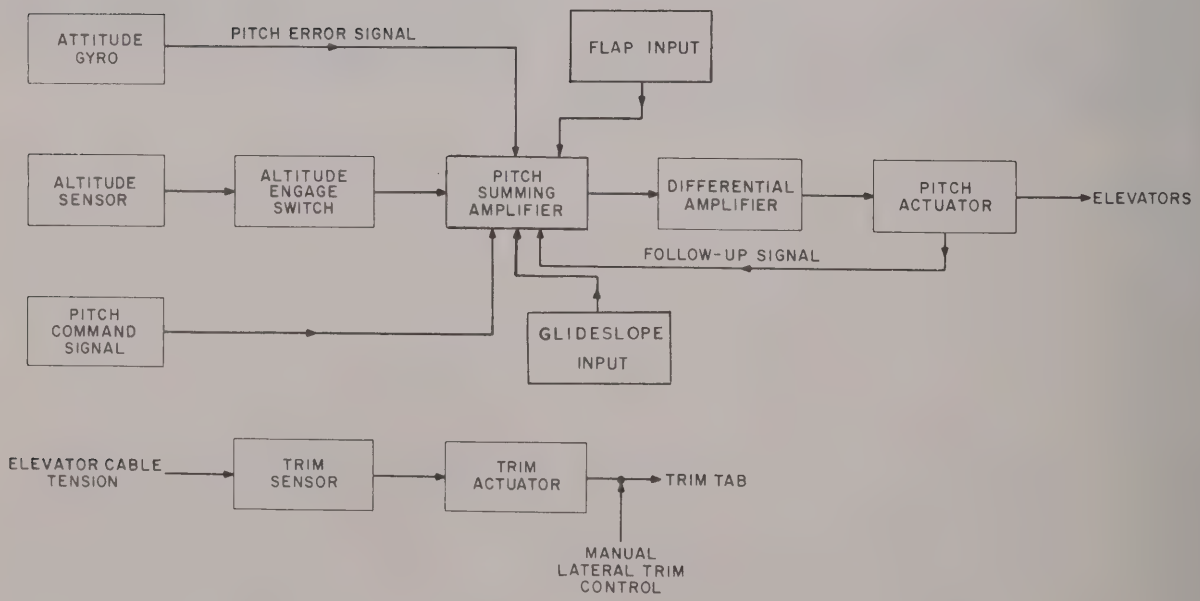


Figure 4-3. Pitch Channel Block Diagram

SECTION V

Maintenance

5-1. MAINTENANCE.

This section contains maintenance information for the 400A Nav-O-Matic autopilot. Included are a list of test equipment, system performance and adjustment procedures, mechanical inspection procedures and removal and replacement procedures.

5-2. TEST EQUIPMENT AND ACCESSORIES.

The following test equipment is available from the Cessna Dealers Organization, in addition, a Ballantine Model 300H, vtvm, a Hewlett-Packard Model 412A vtvm, a Triplett Model 630 vom, a water manometer, a well-regulated 28Vdc power supply rated for 10 amperes, minimum, should be available for use and a source of vacuum to operate the gyro. Equivalent equipment may be substituted.

TABLE 5-1. TEST EQUIPMENT

Qty	Part No.	Name	Use
1	9799001-2 (Part of SK421-31) or 9799002-31	400A Nav-O-Matic/IFCS Test Set	
1	SK421-31	400A Nav-O-Matic Test Unit Assembly	Test points and test signal inputs and interconnecting cables.
1	10182-045 or 10182-033	Omni Deviation Simulator	Supply VOR/LOC and GS error signal for bench test.
1	10182-041	Gyro Test Table	Position attitude gyro.
	Snap On TQ #TQ-6FU	Torqometer	Measure actuator clutch torque.
1	28953	Adapter (Torque)	Couple torqometer to actuator clutch sprocket.
1	SK402-22	Connector Kit	Permits servo amplifier assembly to be extended from motor portion of actuator.

5-3. TROUBLE SHOOTING

Generally, the 400A Nav-O-Matic units are ready for installation if all the adjustments outlined in Preinstallation Adjustments, paragraph 2-1, can be accomplished In the event that operation in the aircraft is unsatisfactory, the best method for troubleshooting is by substitution of units. When troubleshooting the system or individual units on the bench, the information in Table 5-2 may be used as a guide for locating the trouble. Possible causes are not limited to those outlined in the table and in most cases the aircraft wiring or rigging may be included in the list of possible causes.

Bench tests may be accomplished with the use of the test equipment listed above when interconnected as shown in Figure 2-1. Location of computer amplifier electrical adjustments are shown in Figures 6-3 through 6-8.

NOTE

A check of the control cable rigging against the requirements of the specific aircraft installation is advisable during seasonal changes or whenever the aircraft is moved to a region of extreme temperature change. Changes in rigging resulting from temperature variations, or improper rigging of the aircraft and servo cables, will cause improper operation of the autopilot.

TABLE 5-2. TROUBLESHOOTING GUIDE

TROUBLE	PROBABLE CAUSE	CORRECTION
	GENERAL	
ALL SERVOS DEAD	K-4 relay in computer defective.	Refer to Figure 6-1, A-2 relay module, replace K-4 relay or A-2 relay module.
AUTOPILOT WILL NOT ENGAGE. NOTHING HAPPENS WHEN ENGAGE SWITCH IS ACTUATED	Faulty switch or circuitry in control unit.	Refer to Figure 6-5 and 6-6. Repair or replace control unit.
AIRCRAFT WILL NOT HOLD STRAIGHT AND LEVEL WITH AUTOPILOT. ERRATIC PITCH AND ROLL OPERATION, AUTOPILOT ENGAGED AND ON BASIC GYRO MODE. AIRCRAFT SLOWLY ROLLS OR PITCHES-DOES NOT HAVE ATTITUDE REFERENCE	Gyro switch on back of control unit positioned wrong.	Position switch on back of control unit to "IN".
	Defective attitude gyro.	Replace attitude gyro.
AUTOPILOT ENGAGE SWITCH WILL NOT ENGAGE - ROLL AXIS ENGAGES AND PITCH SYNCHRONIZES AND ENGAGES	Autopilot disengage switch on pilot's control wheel or associated wiring is defective.	Refer to applicable aircraft service manual and verify the disconnect and its associated wiring is good.
	$\pm$ 6 Volt monitoring circuit in autopilot control unit is malfunctioning.	Refer to Figure 6-1, A-7 power supply and troubleshoot or replace autopilot control unit.
AUTOPILOT ENGAGE SWITCH WILL NOT ENGAGE - ROLL AXIS ENGAGES - PITCH AXIS WILL NOT ATTEMPT TO SYNCHRONIZE	10 Volt AC power supply in computer is malfunctioning.	Refer to Figure 6-1, A-7 power supply module. Troubleshoot and repair or replace A-7 power supply module.
	$\pm$ 6 Volt power supply in computer is malfunctioning.	Refer to Figure 6-1, A-7 power supply. Troubleshoot and repair or replace A-7 power supply module.
AUTOPILOT WILL NOT DISENGAGE WHEN DISENGAGE SWITCH ON PILOT'S CONTROL WHEEL IS ACTUATED	Defective disengage switch or circuit.	Refer to applicable aircraft wiring diagram and repair switch or associated wiring.
	Faulty disengage ciruit in control unit.	Refer to Figure 6-5 and repair or replace control unit.
ERRATIC PITCH AND ROLL OPERATION. AIRCRAFT ROLLS RIGHT AND PITCHES DOWN ABRUPTLY	Defective pot in computer amplifier power supply $\pm$ 6 volt circuit.	Refer to Figure 6-1, A-7 power supply. Replace defective pot or repair and replace A-7 power supply module card.
	Primary power source defective.	Repair or replace.
	400 - Hz power supply defective.	Repair or replace.
AIRCRAFT WILL NOT HOLD STRAIGHT AND LEVEL	Gyro switch on control unit in OUT position.	Position to "IN".
	Defective attitude gyro.	Replace gyro.

TROUBLE COMMON TO ACTUATORS

TROUBLE	PROBABLE CAUSE	CORRECTION
	GENERAL	
TORQUE NOT CONSTANT WHILE ACTUATOR DRIVES IN RESPONSE TO MANUAL OVERRIDE	Clutch washers dirty or worn.	Clean and adjust, refer to Section 2.
	Clutch faces dirty.	Clean with Trichlorethylene, refer to Section 2.
TORQUE WILL NOT HOLD SETTING	Clutch spring defective.	Overhaul or replace actuator, refer to Section 2.
	TROUBLE COMMON TO ROLL CHANNEL	
FUNCTION WILL NOT ENGAGE AND/OR NULL OUT PROPERLY	Defective roll actuator.	Overhaul or replace roll actuator.
	Roll actuator follow up pot out of calibration (actuator not centered properly).	
	Check computer amplifier null voltages; recalibrate if necessary.	Refer to computer amplifier roll channel adjustment procedures. Check null voltages and realign as necessary.
	Replace roll assembly A3.	Defective A3 roll.
	Replace model assembly A1.	Defective A1 model card.
	Check control unit.	Control unit defective.
	Replace attitude gyro.	Attitude gyro defective.
ROLL MODES FUNCTION, BUT ARE SLUGGISH OR ERRATIC. EXCESSIVE ROLL OSCILLATION WHILE FLYING BASIC GYRO OR HEADING MODES. (AIRCRAFT REQUIRES MORE THAN 5 SECONDS TO ROLL LEVEL FROM A 25° ROLL COMMAND.)	Low aileron and/or roll actuator cable tension.	Refer to applicable aircraft service manual and adjust cables for proper tension.
	Roll actuator clutch slipping at low torque.	Refer to Table 2-1 and verify proper roll actuator clutch torque setting.
	Misaligned computer.	Refer to Section 2, alignment procedures and align computer.
	Defective roll circuitry in computer.	Check A-3 and A-1 module cards. Repair or replace as necessary.
	Gyro gain not set properly, readjust A1R9.	Readjust A1R9.
	Replace roll assembly A3.	Defective A3 roll card.
	Replace model assembly A1.	Defective A1 model card.
	Power supply A7 not properly calibrated.	Calibrate.
	Check aircraft rigging.	Aircraft improperly rigged.

cont. TROUBLE COMMON TO ROLL CHANNEL

TROUBLE	PROBABLE CAUSE	CORRECTION
	GENERAL	
ROLL MODES FUNCTIONING, BUT AIRCRAFT BANKS MORE OR LESS THAN 25° WHEN TURN COMMAND KNOB IS FULL LEFT OR RIGHT OR TO INTERCEPT A NEW HEADING IN "HEADING MODE"	Maximum roll command and/ or heading bank angles need to be adjusted to 24 ± 2° left and right (in-flight).	Refer to Section 2 and perform in-flight adjustment of bank angles.
ROLL COMMAND INOPERATIVE	Defective command pot in control unit.	Repair or replace control unit.
	Check roll actuator	Defective roll actuator
	Basic gyro gain not set properly.	Adjust A1R9 for left turn; adjust A1R6 for right turn.
	Replace roll assembly A3.	Defective roll card A3.
	Replace model assembly A1.	Defective (A1) model card.
	Check attitude gyro.	Defective attitude gyro.
	Check aircraft rigging.	Aircraft improperly rigged.
HEADING MODE INOPERATIVE	Heading engage switch or circuitry in control unit inoperative.	Repair or replace control unit.
	Defective directional gyro.	Check heading signal from directional gyro. Repair or replace as necessary.
	Heading selector inoperative.	Check heading selector and associated wiring.
	Defective computer.	Check A-2, A-3 and A-1 module cards. Repair or replace as necessary.
	Replace roll assembly A3.	Defective (A3) roll card.
	Replace model assembly A1.	Defective (A1) model card.
	Check wiring relay assembly A2.	Relay (A2) amproperly wired
HEADING BRACKETING; AUTOPILOT CAUSES THE AIRCRAFT HEADING TO VARY + 2 OR 3 DEGREES FROM THE SELECTED HEADING	Computer out of alignment	Realign heading demod and head-ing omni circuit in the computer.

TROUBLES COMMON TO PITCH CHANNEL

TROUBLE	PROBABLE CAUSE	CORRECTION
AUTOPILOT PITCH AXIS WILL NOT ENGAGE - ROLL AXIS ENGAGES AND PITCH AXIS ATTEMPTS TO SYNCHRONIZE, BUT COMMAND WHEEL RUNS TO UP OR DOWN STOP	Pitch actuator is not centered properly.	Refer to pitch actuator - centering adjustment procedures and center actuator.
	Pitch actuator follow up pot is malfunctioning.	Repair or replace follow up pot index (96) Figure 7-1.
	Computer is malfunctioning.	Refer to Figure 6-1, A-4 pitch module card and repair or replace.
	Replace control unit	
	Replace relay K2 in computer amplifier.	Defective K2 relay assembly.
	On relay assembly A2	Replace A2CR4, A2CR5, A2CR6, or A2CR7.
PITCH MODES FUNCTION, BUT ARE SLUGGISH AND/OR ERRATIC. PITCH OSCILLATIONS ARE SLOW TO DAMPEN OR ARE EASY TO INDUCE WHILE FLYING IN THE BASIC OR GYRO MODE	Pitch gyro out of adjustment.	Refer to Section 2 and adjust gyro sensitivity on the bench.
	Replace pitch assembly A4.	Defective pitch assembly.
	Power supply A7 not properly calibrated.	Calibrate.
	Check aircraft rigging	Aircraft improperly rigged.
	Check pitch actuator	Pitch actuator defective.
	Check attitude gyro	Attitude gyro defective.
	Replace model assembly A1.	Defective A1 model card.
PITCH MODES FUNCTION, BUT ARE SLUGGISH AND/OR ERRATIC. ABRUPT PITCH CHANGES INITIATED BY AUTOPILOT TRIM (PITCH TRIM WHEEL STARTS MOVING SIMULTANEOUSLY WITH AIRCRAFT)	Incorrect trim sensor time delay in either or both directions.	Refer to Section 2, check trim sensor time delay-adjust or replace pitch trim sensor as necessary.
	Pitch actuator clutch torque low.	Refer to Section 2, Table 2-1, and adjust actuator for proper torque.
	Pitch actuator cable tension set too low.	Refer to applicable aircraft service manual and adjust cable tension.
PITCH MODES FUNCTION, BUT ARE SLUGGISH AND/OR ERRATIC, ABRUPT PITCH CHANGES INITIATED BY THE PITCH ACTUATOR (PITCH TRIM WHEEL DOES NOT MOVE UNTIL AFTER THE AIRCRAFT ATTITUDE STARTS TO CHANGE)	Defective actuator follow up pot or associated wiring.	Repair or replace pitch command pot - refer to Figure 6-5.

cont. TROUBLE COMMON TO PITCH CHANNEL

TROUBLE	PROBABLE CAUSE	CORRECTION
ALTITUDE HOLD MODE ERRATIC. ABRUPT PITCH CHANGES INITIATED BY THE PITCH ACTUATOR (PITCH WHEEL DOES NOT MOVE UNTIL AFTER THE AIRCRAFT ATTITUDE STARTS TO CHANGE)	Moisture or water in static line to computer.	Disconnect static line at computer and sump and blow out static line in accordance with applicable service manual.
	Altitude sensor malfunctioning.	Replace altitude sensor.
PITCH MODES FUNCTION, NORMAL EXCEPT, AUTOPILOT DOES NOT CORRECT PROPERLY FOR AIRCRAFT ATTITUDE CHANGES WITH FLAP OPERATION	Autopilot computer not receiving correct voltage from the pot on the flap actuator.	Refer to Section 2. Check voltage from the flap actuator pot, adjust or replace pot as necessary.
PITCH MODES FUNCTION BUT ARE SLUGGISH AND/OR ERRATIC. PITCH TRIM ACTUATOR RUNS, BUT ELEVATOR TRIM WHEEL DOES NOT MOVE (MAY CAUSE AN ABRUPT PITCH CHANGE WHEN THE AUTOPILOT IS DISENGAGED)	Low trim actuator cable tension causing slippage on cable drum.	Refer to applicable aircraft service manual and adjust cable tension.
PITCH MODES FUNCTION BUT ARE SLUGGISH AND/OR ERRATIC. AUTOPILOT PITCH TRIM ACTUATOR OPERATES IN ONE DIRECTION FROM ZERO ONLY	Faulty trim sensor.	Repair or replace trim sensor.
	Replace pitch trim actuator.	Defective trim actuator.
	Check aircraft rigging.	Rig in accordance with applicable aircraft service manual.
PITCH COMMAND INOPERATIVE (NO UP OR DOWN AUTHORITY)	Defective command pot in control unit.	Repair or replace control unit.
	Defective pitch actuator.	Overhaul or replace pitch actuator.
	Defective A-1 module card.	Check A-1 module. Repair or replace as necessary.
	Defective A-4 pitch module in computercard.	Check A-4 module card. Repair or replace as necessary.
PITCH MODE FUNCTIONS, BUT IS SLUGGISH AND/OR ERRATIC. AUTOPILOT PITCH TRIM ACTUATOR DOES NOT RUN	Trim sensor inoperative or electrical connector not connected.	Check trim sensor electrical connection for proper connection.
	Defective trim actuator.	Overhaul or replace trim actuator PA520A.
ALTITUDE HOLD MODE WILL NOT ENGAGE-AIRCRAFT CHANGES PITCH ATTITUDE WHILE THE ALTITUDE SWITCH IS HELD ENGAGED MANUALLY	Defective altitude sensor in computer.	Replace sensor.
	Pitch synchronization in computer needs alignment on bench.	Refer to Section 2, pitch synchronization and align on bench.

TROUBLE COMMON TO PITCH CHANNEL

TROUBLE	PROBABLE CAUSE	CORRECTION
ALTITUDE HOLD MODE WILL NOT ENGAGE MANUALLY - HOLDING CAUSES NO CHANGE IN AIRCRAFT PITCH ATTITUDE	Defective computer, replace K6 in computer amplifier.	Check K-6 relay, A-1, A-4 and A-6 modules in computer. Repair or replace as necessary.
	Defective engage switch or circuitry in control unit.	Repair or replace control unit.
	Defective interlock.	Replace pitch radio assembly A6.
	Replace relay K6 in computer amplifier.	Defective relay module.
	Replace pitch assembly A4.	Defective pitch radio card.
	Replace altitude sensor A8.	Defective altitude A8 card.
	Replace model assembly A1.	Defective roll module card.
ALTITUDE HOLD POOR; AIRCRAFT PORPOISES OR TAKES EXCESSIVE TIME TO REACH SELECTED ALTITUDE	Altitude gain control out of adjustment.	Adjust gain A1R37 in accordance with adjustment procedures on the bench.
	Defective A-4 pitch module card in computer.	Repair or replace A-4 pitch module card.
	Defective A-8 altitude sensor in computer.	Replace A-8 altitude sensor.
	Defective A-1 module card in computer.	Repair or replace A-1 module card.
	Basic pitch gain control improperly adjusted.	Adjust A1R34 in accordance with adjustment procedures.
	TROUBLE WITH VOR/ILS COUPLER	
SHALLOW BANK ANGLES ON VOR/ILS INTERCEPT	Heading bank angle adjustment, angles should be 10° less than maximum heading bank angle. Readjust A3R13 and A3R14 as required.	Check bank angles in heading mode.
	Incorrect signal from navigation set.	Check signal from NAV; should be 30 millivolts per dot.
	A-5 roll radio card in computer.	Repair or replace A-5 roll radio card.
	Defective A-1 module card in computer.	Repair or replace A-1 module card.
	K-5 relay in computer amplifier inoperative.	Replace K-5 relay.

TROUBLE WITH VOR/ILS COUPLER

TROUBLE	PROBABLE CAUSE	CORRECTION
NAV MODE DOES NOT INTERCEPT A VOR RADIAL PROPERLY OR FAILS TO CORRECT FOR CROSSWIND WHILE IN TRACK MODE (MAXIMUM CRAB ANGLE AVAILABLE IS APPROXIMATELY 15°). WITH FULL SCALE OBI DEFLECTION AND A HEADING CHANGE BETWEEN 60° and 110°, THE INTERCEPT ANGLE IS NOT THE REQUIRED 45 ± 2 DEGREES	Right and left intercept adjustment pots in computer out of adjustment.	Refer to Section 2, and adjust intercept angle.
	Incorrect heading source voltage to computer.	Verify heading source voltage is 158 millivolts per degree. Add or delete resistance in RJB1 to obtain proper voltage.
		Repair or replace A-5 roll radio module.
FAILS TO CAPTURE AND TRACK VOR RADIAL	Defective A-5 roll radio module in computer	
	Defective A-1 module card in computer.	Repair or replace A-1 module card.
	K-5 relay in computer amplifier defective.	Replace K-5 relay.
	Defective NAV engage switch on control unit.	Replace switch.
	Check output signal from navigation set is proper.	Repair or replace NAV receiver.
EXCESSIVE BANK ANGLE ON STATION PASSAGE	Defective roll radio module in computer.	Repair or replace A-5 roll radio module.
FAILS TO CAPTURE AND TRACK LOCALIZER	Improper NAV input signal.	Verify that output signal from NAV set is 30 millivolts per dot.
	Defective A-5 roll radio module in computer.	Repair or replace A-5 roll radio module.
	Defective A-1 module card in computer.	Repair or replace A-1 module card.
	Check that output signal from navigation set is proper.	Repair or replace NAV receiver.
FAILS TO CAPTURE AND TRACK GLIDESLOPE	Improper NAV input signal.	Verify that output signal from NAV set is 30 millivolts per dot.
	Defective A-6 pitch radio module card in computer.	Repair or replace A-6 pitch radio module card.
	Defective K-1 or K-3 relay in computer amplifier.	Repair or replace K-1 and /or K-3 relays in computer amplifier.
	Defective A-5 roll radio module card in computer.	Repair or replace A-5 roll radio module card.
	Check output signal from NAV set.	Repair or replace NAV receiver.

TROUBLE	PROBABLE CAUSE	CORRECTION
FAILS TO CAPTURE AND TRACK GLIDESLOPE	Improper NAV input signal.	Verify that output signal from NAV set is 30 millivolts per dot.
	Defective A-6 pitch radio module card in computer.	Repair or replace A-6 pitch radio module card.
	Defective K-1 or K-3 relay in computer amplifier.	Repair or replace K-1 and/or K-3 relays in computer amplifier.
	Defective A-5 roll radio module card in computer.	Repair or replace A-5 roll radio module card.

5-3A. POWER SUPPLY.

NOTE

If voltage or frequency checks are in tolerance, do not adjust or peak up.

Step 1. Turn A/P on. TP-20 shall be 28.0 V DC ±1%. If not, adjust power source for proper voltage.

Step 2. Wait ten (10) minutes. TP-18 should read 10.0 V RMS ±2%. If not, adjust A7R12 for proper reading. Frequency should be 400 ±5Hz. If not, adjust A7R2 for proper frequency.

Step 3. Check at TP-19 for +6 V DC ±1%. If proper reading is not obtained, adjust A7R30 for correct value.

Step 4. Check at TP-9 for -6 V DC ±1%. If proper reading is not obtained, adjust A7R30 for correct value.

NOTE

If any power supply adjustments are made, all null voltages should be checked.

NOTE

Adjustment callouts in parentheses are for computers with serial numbers shown in Figure 6-1, Sheet 1.

Null Voltage Adjustments

Disconnect attitude gyro and heading gyro. Set the localizer enable switch to "OUT," and set the glide slope disable to "OUT," push in the heading knob and adjust the roll trim until TP-15 is less than ±5 mV DC.

Heading Demodulation: (Refer to Figure 2-2.) Adjust A3R48 until TP-21 is less than ±10 mV DC.

Heading Amplifier: Adjust A3R10 (A3R2) until TP-22 is less than ±10 mV DC.

Roll Amplifier: Disconnect plug P6 and adjust A3R24 (A3R11) until TP-17 (Pin 8 of A3-IC2) is less than ±10 mV DC.

Roll Follow-up: Reconnect plug P6 and adjust A3R30 (A3R19) until TP-16 is less than ±10 mV DC.

Pitch Command: With the flap input to the "OUT" position, adjust the pitch command wheel until TP-5 is less than ±5 mV DC.

Altitude Hold Amplifier: Remove plug J4 from the altitude sensor and ground contact J4F. Adjust A4R9 (A4R61) until TP-24 is less than ±5 mV DC.

Altitude Sensor: Reconnect plug J4. TP-24 shall be less than ±100 mV DC.

Pitch Amplifier: Remove plug P7 and adjust A4R24 (A4R13) until the voltage at TP-7 (Pin 8 of A4-IC2) is less than ±10 mV DC.

Pitch Follow-up: Reconnect plug P7 and adjust A4R30 (A4R24) until TP-6 is less than ±10 mV DC.

Pitch Radio: With the omni simulator OFF, engage the NAV switch and adjust A6R16 until TP-2 is less than ±15 mV DC.

Pitch Radio Demodulator: Adjust A6R4 until the voltage at TP-1 (across A6-C1) is less than ±5 mV DC.

NOTE

Repeat Pitch Radio and Pitch Radio Demodulator steps until both are within specifications.

Roll Radio: With the omni simulator OFF, adjust A5R22 (A5R23) until TP-12 is less than ±30 mV DC.

Tracking Circuit: Adjust A5R4 until TP-11 (voltage at cathode of A5CR12) is less than ±10 mV DC.

NOTE

Repeat Roll Radio and Tracking Circuit steps until both are within specifications.

System Null: Pull out the heading knob; the roll actuator shall turn a maximum of ±2°.

Gain and Limiter Adjustments

Omni Left to Track: Turn omni simulator ON, set VOR LOC/GS switch to VOR/LOC position, set for 30 mV DC LEFT and adjust A5R25 (A5R26) full CW. Close the NAV switch and slowly adjust A5R25 (A5R26) CCW until TP-25 (cathode of A5-CR16) switches from greater than 10. 0 V DC to between 0. 0 and -1. 0 V DC.

Omni Right to Track: Set the omni simulator for 30 mV DC RIGHT and adjust A5R36 (A5R34) full CW. Open and reclose the NAV switch. Slowly adjust A5R36 (A5R34) CCW until TP-25 (cathode of A5-CR16) switches from greater than 10. 0 V DC to between 0. 0 and -1. 0 V DC.

Heading Right to Track: Turn the omni simulator OFF, reconnect heading gyro and set to 000°, connect heading selector (S-520A) and adjust CW for a greater than 5. 0 V RMS reading at TP-23. Open and reclose the NAV switch. Wait approximately thirty (30) seconds and then slowly decrease the heading selector CCW until TP-25 (cathode of A5-CR16) switches from greater than 10. 0 V DC to between 0. 0 and -1. 0 V DC. TP-23 shall then be between 1. 5 and 3. 5 V RMS.

Heading Left to Track: Repeat the previous step for a CCW setting of the heading preselector.

5-4. MECHANICAL INSPECTION.

Periodic preventive maintenance inspections reduce the possibility of system failures, uncover defective parts, and enable service or operating personnel to take corrective action before over-all operation of the equipment is affected. Perform the following procedures at the annual inspection, or every 100 hours of operations, whichever comes first, and also after replacement of defective parts.

400A Nav-O-Matic Autopilot Units.

a. Check connectors for dirty, loose or broken terminals.

b. Inspect interconnecting wires for loose or corroded connections and for stripped or broken insulation.

c. Inspect vacuum connections to gyros for signs of corrosion or leakage.

d. Inspect mounting hardware on all units for tightness.

e. Inspect electric clutches on actuators for dirt and improper operation.

f. Check mechanical clutch adjustments.

g. Check computer amplifier static air inlet connector for tightness.

Rigging.

a. Inspect sprockets and attached chains for signs of wear. Clean and lubricate as specified in paragraph 5-5.

b. Check mechanical connections between rigging hardware and cables for security and signs of wear.

c. Check tension of aileron, elevator and actuator cables. It is essential that all cables are kept tight for proper operation of the autopilot. See applicable Aircraft Service Manual for the particular aircraft involved for control cable tension values.

d. Check aileron and elevator control systems for binding and roughness of operation.

5-5. LUBRICATION.

The actuators and the drive chain should be lubricated with a small amount of Aeroshell No. 7 Grease at the annual inspection, or after every 100 hours of operation, whichever comes first. Before applying new lubricant to any surface, remove the old lubricant with an approved cleaning solvent.

CAUTION

Do not lubricate the clutch gear. Lubricant at this point can contribute to improper action of the mechanical clutch.

5-6. REMOVAL AND REPLACEMENT PROCEDURES.

General.

The units of the 400A Nav-O-Matic may be serviced in the field; however, replacement parts must be identical to the original parts to ensure optimum performance. After replacing any part, check performance of the entire system.

Location of Parts.

The location of the 400A Nav-O-Matic units in the aircraft depends on the aircraft in which the system is installed. Refer to the applicable aircraft Service Manual for location of components.

For location of the parts within a unit, refer to the appropriate illustration in the diagram section of this manual.

Replacement of Semiconductors.

All of the electrical circuits of the autopilot use solid-state devices: transistors, diodes, and integrated circuits which contain semiconductors. Most of these devices are soldered in the circuit; before soldering or unsoldering any of these components, disconnect the power source from the system and make sure the soldering iron is grounded. Always use a hot, small-wattage iron (35 watts or less). While soldering, use a heat sink between the solder joint and the device to prevent excessive heat from damaging the part. Check polarity and route the leads as nearly like the original as possible.

Removal of Actuator.

The locations for the actuators vary with the aircraft model. Refer to the installation instructions for the particular aircraft model, and reverse the procedure to remove the actuator. The electronic components for the PA-500A are included on the plate assembly which may be removed for maintenance without disturbing the motor portion of the actuator.

Disassembly of Actuator.

For disassembly of actuator, refer to the exploded view in Figure 7-1. Parts are listed in the recommended disassembly order.

Replacement of Actuator Servo Motor Brushes. (See Figure 7-1.)

The actuator servo motor brushes should be replaced when faulty operation is suspected or after 500 hours of operation. To replace the brushes, proceed as follows:

Step 1. Remove plastic clamp that holds motor cable to motor.

Step 2. Remove four screws (39, Figure 7-1) and pull motor away from actuator case.

Step 3. Remove screw (44) and slide cover (43) from motor.

Step 4. Remove two screws on top of motor that interconnect capacitors and brush leads.

Step 5. Using a sharp pointed tool, lift out coil springs and brushes, and unsolder brush leads.

Step 6. Blow carbon dust from commutator and inspect commutator for wear. Replace if necessary.

Step 7. Install new brushes and reassemble motor and actuator.

Replacement of Actuator.

Step 1. Refer to installation instructions for the particular aircraft, and reinstall actuator

Step 2. Recenter actuator as outlined in post-installation adjustment (2-9).

Removal of Control Unit.

To remove the control unit, remove emblem and turn the retaining screw adjacent to the lateral trim control counterclockwise until it releases. Pull the unit out of the dust cover.

Disassembly of Control Unit.

The control unit components are accessible when the unit is removed from its dust cover. Refer to Figure 6-6, to locate the parts.

Removal of Computer Amplifier.

The computer amplifier is mounted in the aircraft with Mounting 37980. The unit is secured to the mounting with a clamp-and-nut arrangement. To remove the computer amplifier, turn the nut counterclockwise, and loosen the clamp. Lift the unit from the mounting.

Disassembly of Computer Amplifier.

The computer amplifier consists of removable module assemblies and the chassis assembly. Assemblies A1 and A3 through A6 are printed circuit board assemblies which connect to the chassis assembly through Elco connectors, while A7 and A10 are printed circuit boards soldered in the circuit and secured with screws. To remove any of the assemblies A1 or A3 through A6, remove the two screws and spacers that secure the printed circuit boards. Grasp the board firmly by the two upper corners and gently "walk" the board up to disconnect the Elco connectors. To remove A7, when the two screws and spacers have been removed, remove the four mounting screws and unsolder the interconnecting wiring. To remove A10, remove the three mounting screws and unsolder the wiring.

The six relays of assembly A2 are plugged into sockets and secured in position by a cover assembly. To remove any relay, remove the two screws that hold the cover assembly and pull the relay from the socket. To remove the bracket assembly of A2 from the chassis, remove the three screws that secure the assembly to the front of the chassis.

Altitude sensor A8 is enclosed in a round cover assembly that is secured to the chassis by six screws on the bottom of the unit. To remove A8, remove the six screws, disconnect the electrical and static connectors from the assembly, and remove the assembly. Remove the two screws on the end that hold the assembly in the cover.

Removal of Pitch Trim Sensor.

The electronic components for the DT-520A are part of the cover assembly. To lift, remove 4 screws on bottom and disconnect three terminal connectors on inside. When replacing cover assembly use caution in placement of connector so that it will not interfere with the switch.

SECTION VI

Wiring Diagram

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Figure 6-1. CA530A Computer Amplifier Schematic (Sheet 3)
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Figure 6-13. G520A Directional Gyro Schematic
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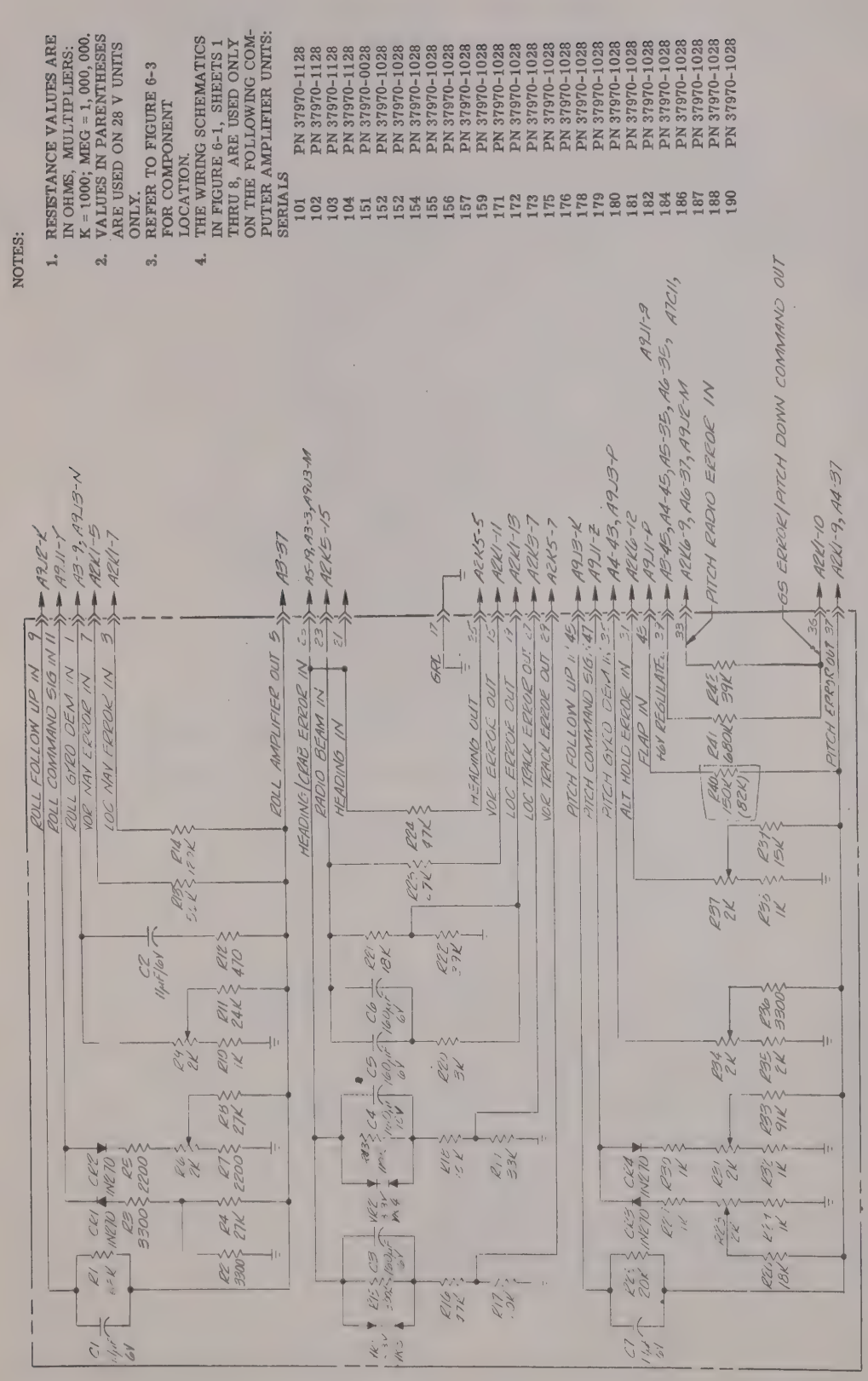
Figure 6-15. S520A Heading Selector Schematic
Figure 6-16. S520A Heading Selector Wiring Diagram
Figure 6-17. 400A Nav-O-Matic Interconnecting Diagram

NOTES:

1. RESISTANCE VALUES ARE IN OHMS, MULTIPLIERS: K = 1000; MEG = 1, 000, 000.
2. VALUES IN PARENTHESES ARE USED ON 28 V UNITS ONLY.
3. REFER TO FIGURE 6-3 FOR COMPONENT LOCATION.
4. THE WIRING SCHEMATICS IN FIGURE 6-1, SHEETS 1 THRU 8, ARE USED ONLY ON THE FOLLOWING COMPUTER AMPLIFIER UNITS:

SERIALS	
101	PN 37970-1128
102	PN 37970-1128
103	PN 37970-1128
104	PN 37970-1128
151	PN 37970-0028
152	PN 37970-1028
152	PN 37970-1028
154	PN 37970-1028
155	PN 37970-1028
156	PN 37970-1028
157	PN 37970-1028
159	PN 37970-1028
171	PN 37970-1028
172	PN 37970-1028
173	PN 37970-1028
175	PN 37970-1028
176	PN 37970-1028
178	PN 37970-1028
179	PN 37970-1028
180	PN 37970-1028
181	PN 37970-1028
182	PN 37970-1028
184	PN 37970-1028
186	PN 37970-1028
187	PN 37970-1028
188	PN 37970-1028
190	PN 37970-1028



A1
MODULE CARD

USED WITH P/N 37970-1028 AND P/N 37970-1128

Figure 6-1. CA530A Computer Amplifier Schematic (Sheet 1 of 8)

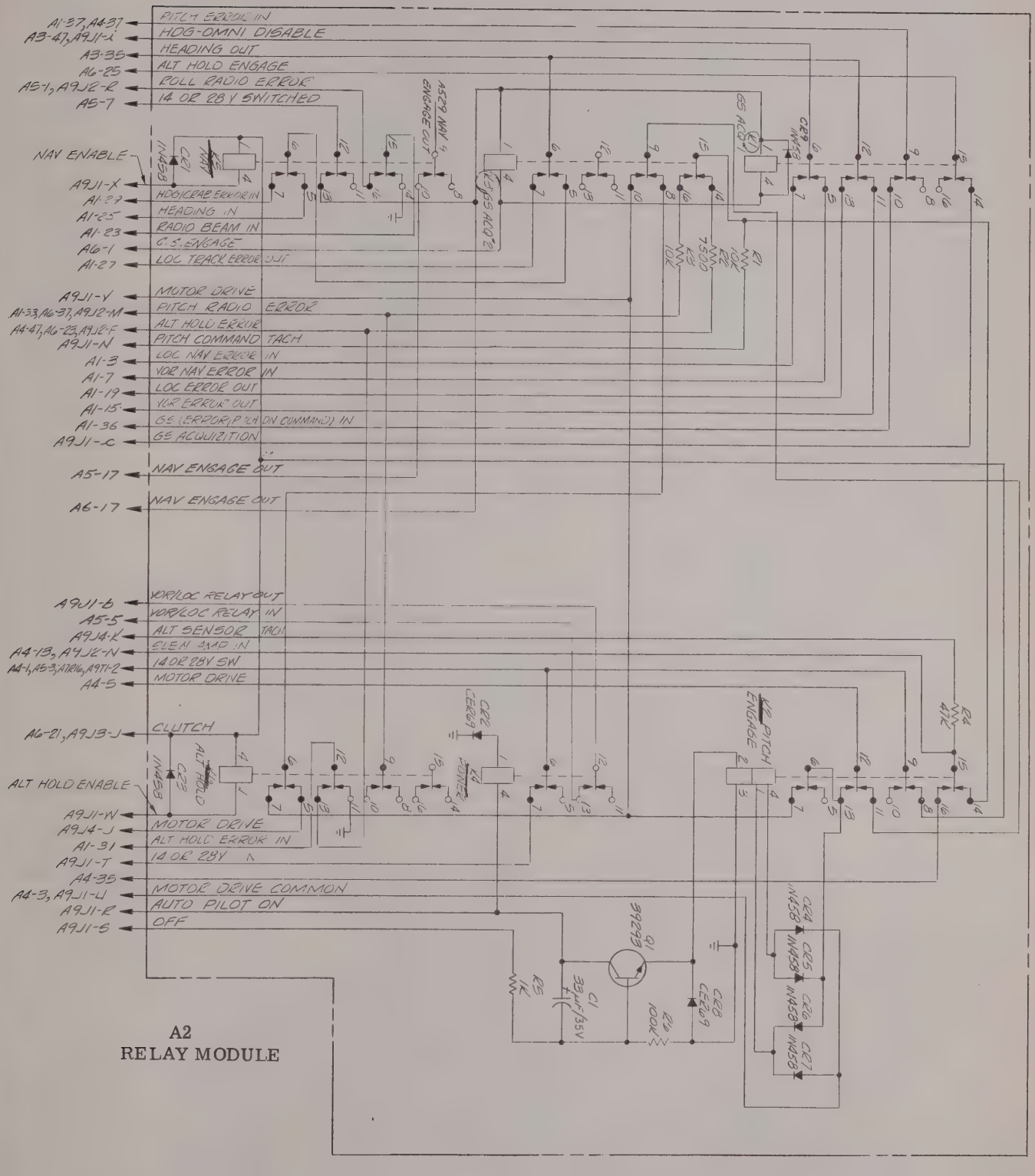


Figure 6-1. CA530A Computer Amplifier Schematic (Sheet 2)

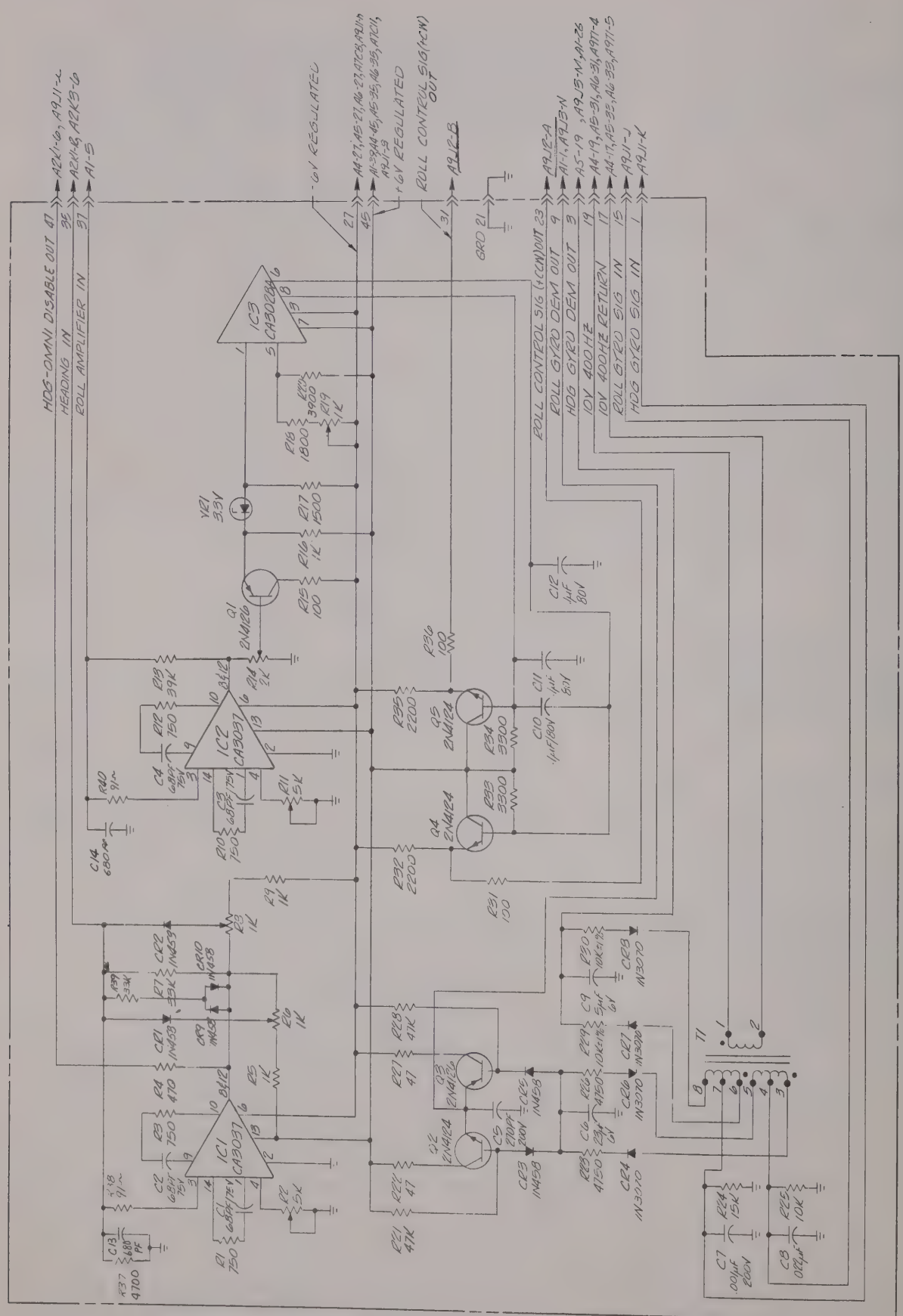


Figure 6-1. CA530A Computer Amplifier Schematic (Sheet 3)

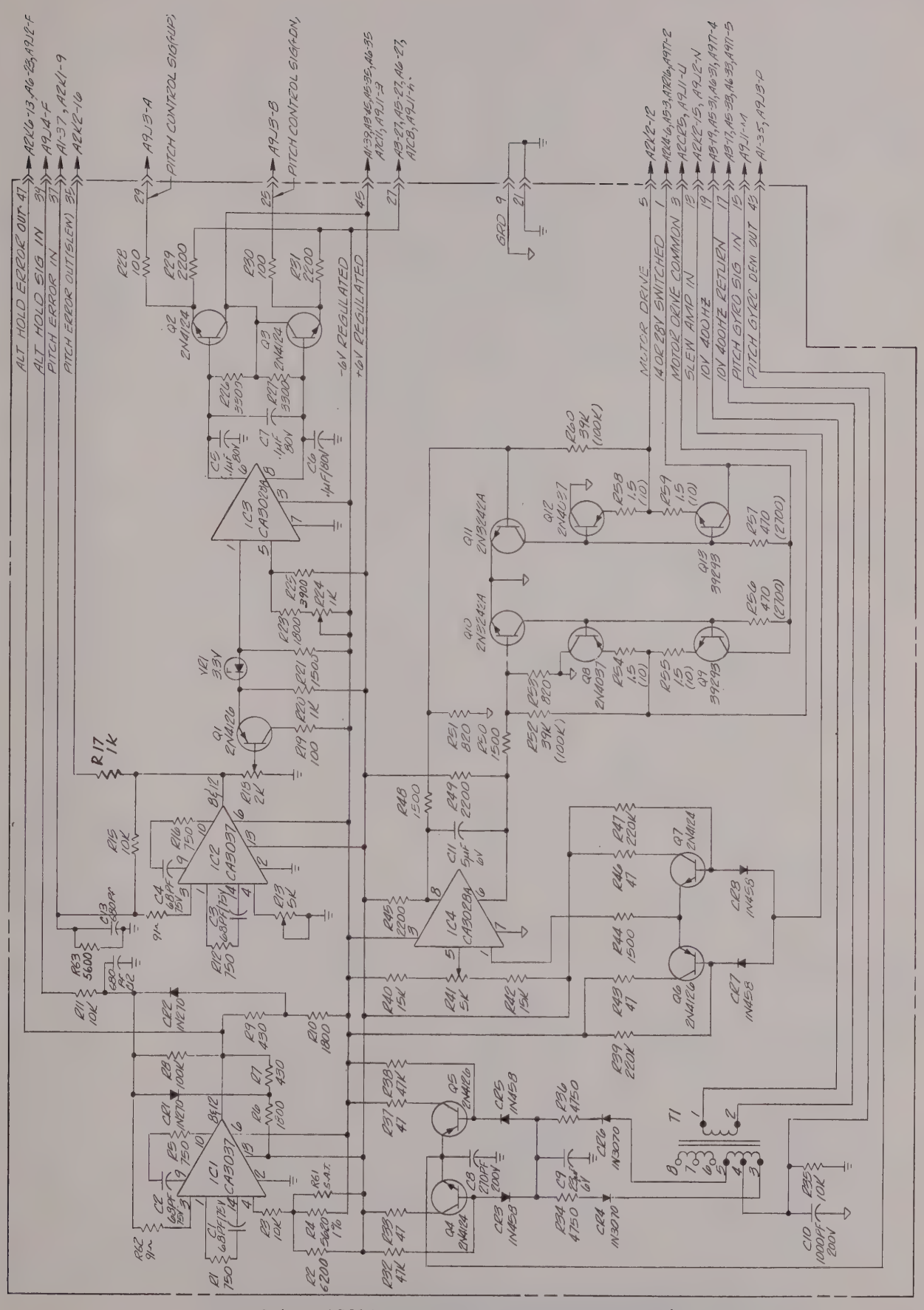


Figure 6-1. CA530A Computer Amplifier Schematic (Sheet 4)

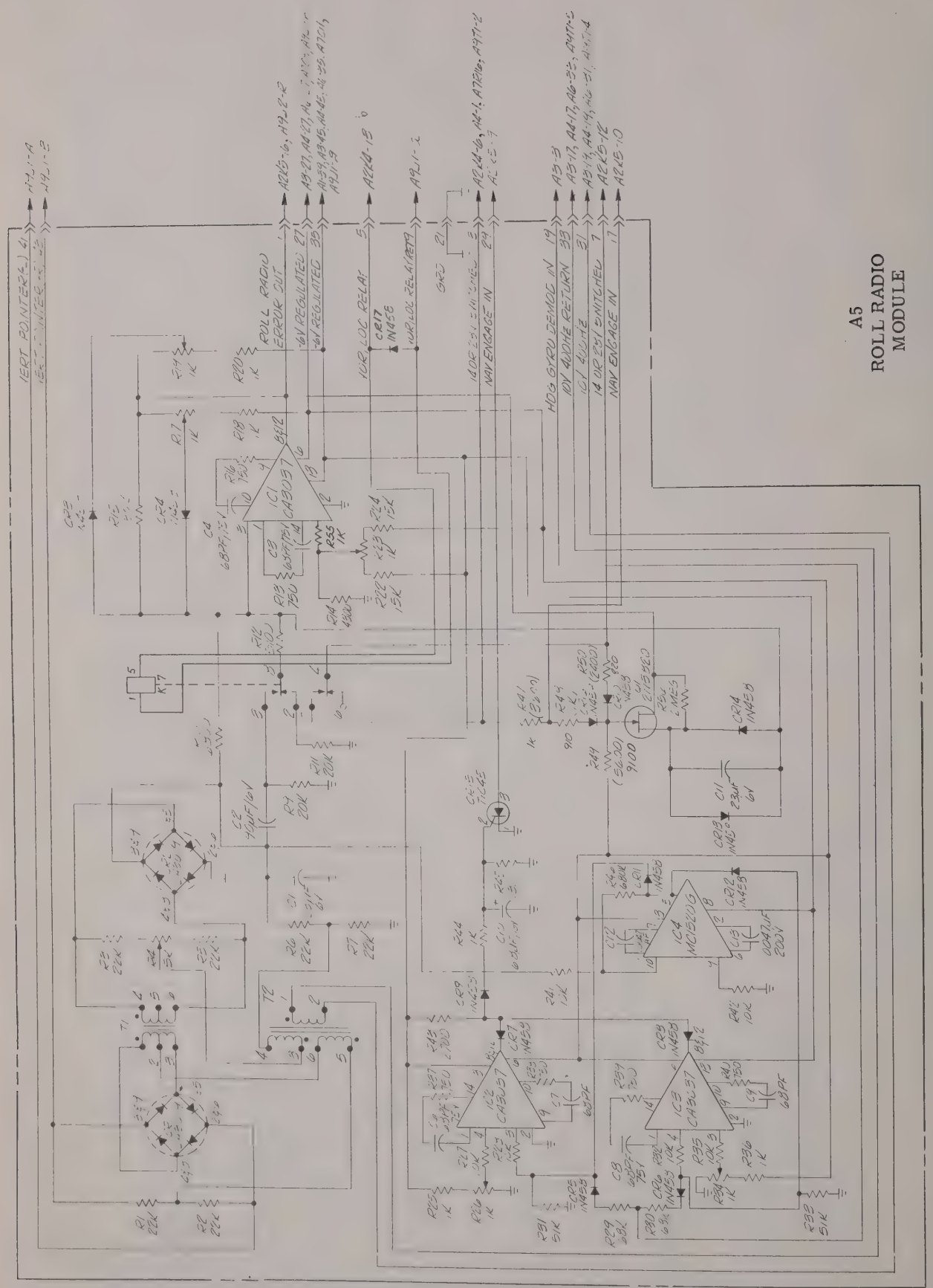


Figure 6-1. CA530A Computer Amplifier Schematic (Sheet 5)

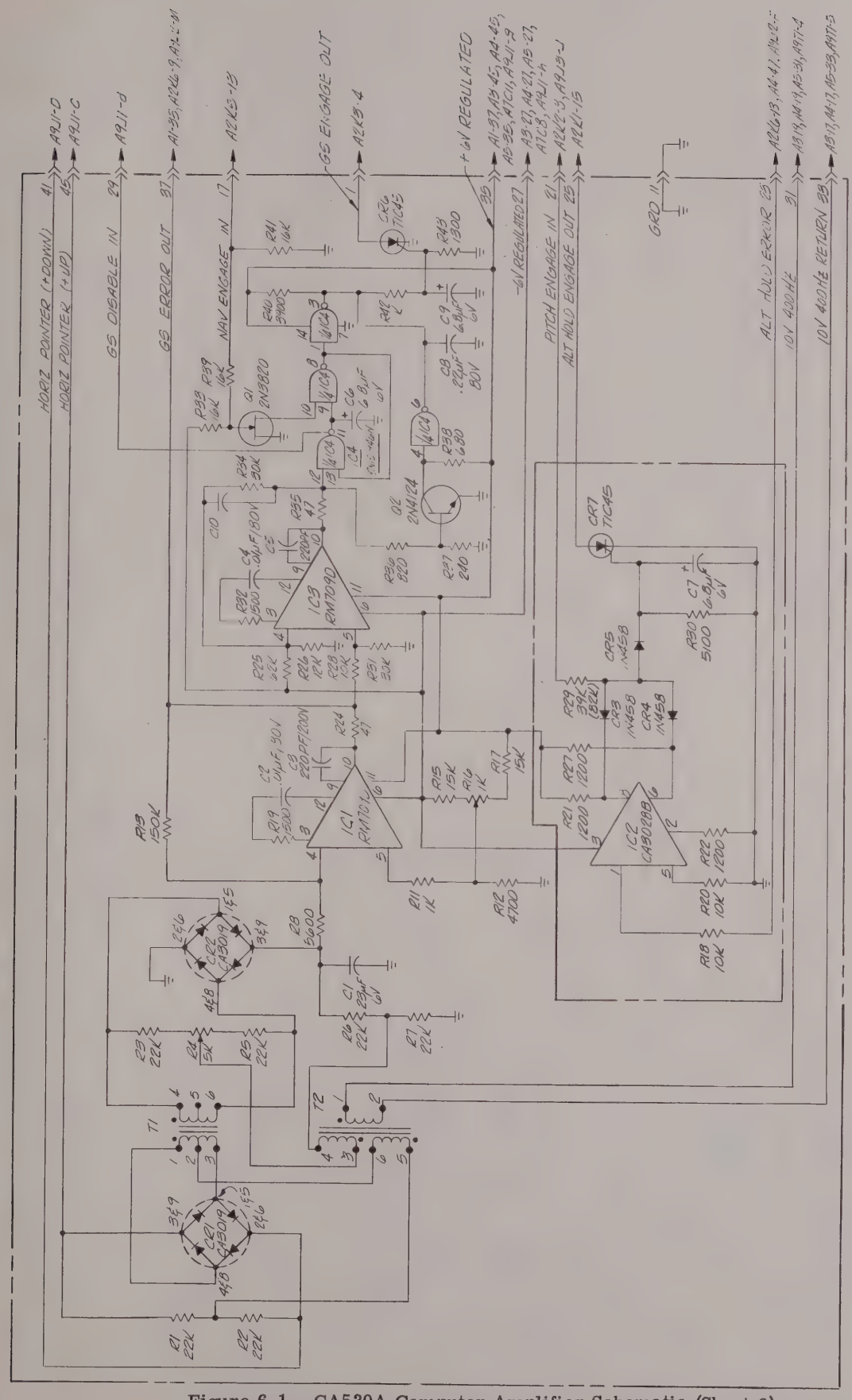
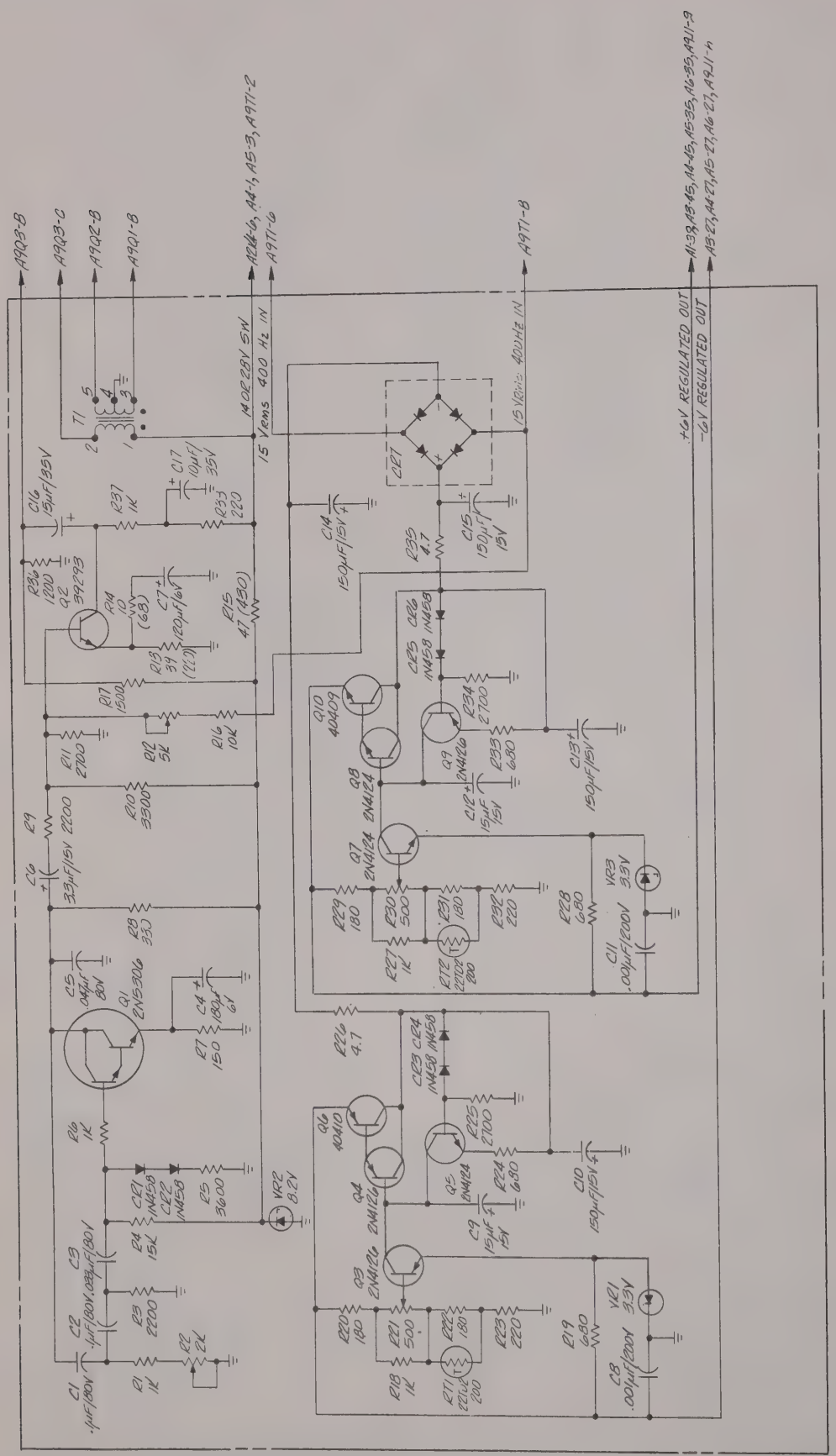


Figure 6-1. CA530A Computer Amplifier Schematic (Sheet 6)



A7
POWER SUPPLY
MODULE

Figure 6-1. CA530A Computer Amplifier Schematic (Sheet 7)

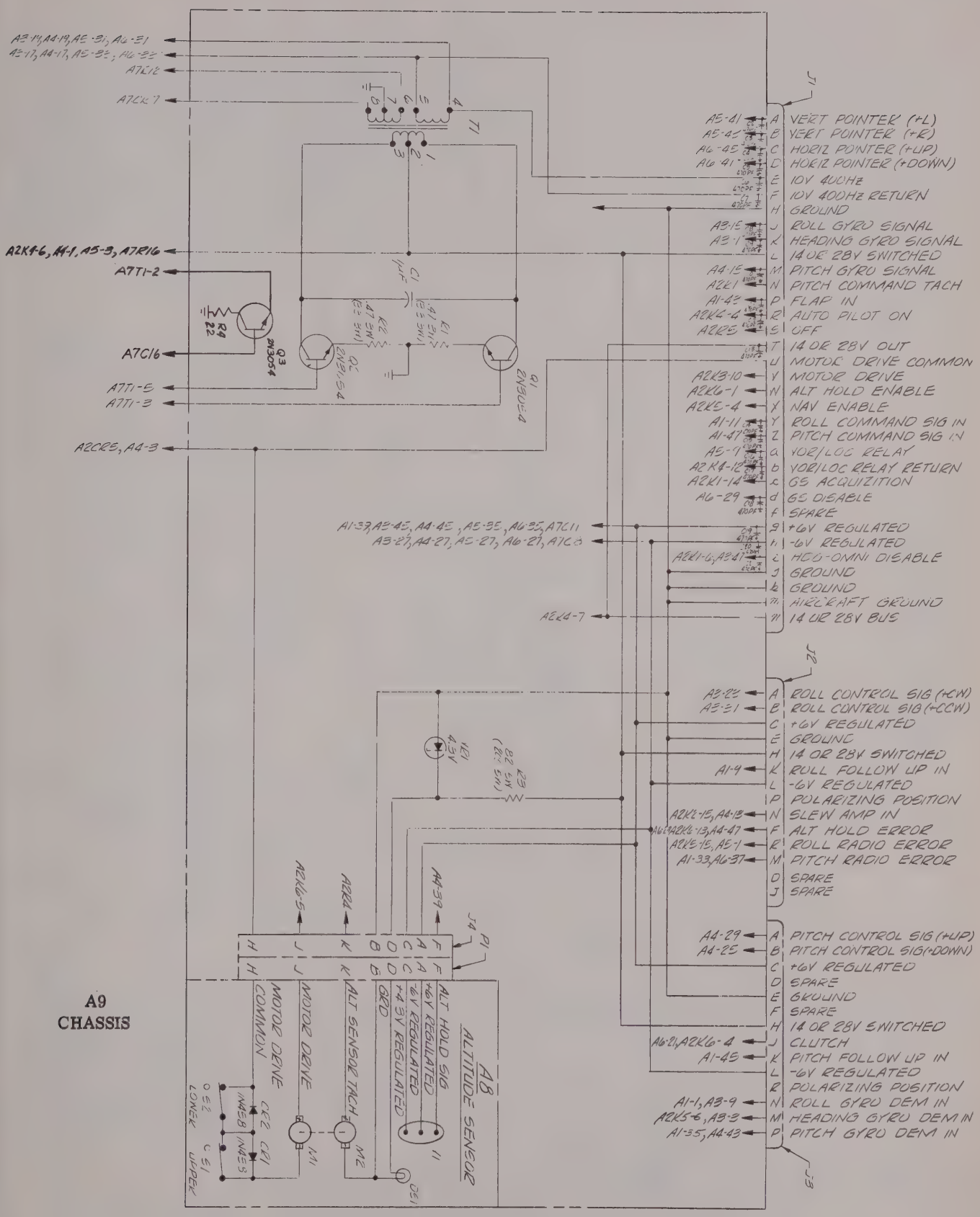


Figure 6-1. CA530A Computer Amplifier Schematic (Sheet 8)

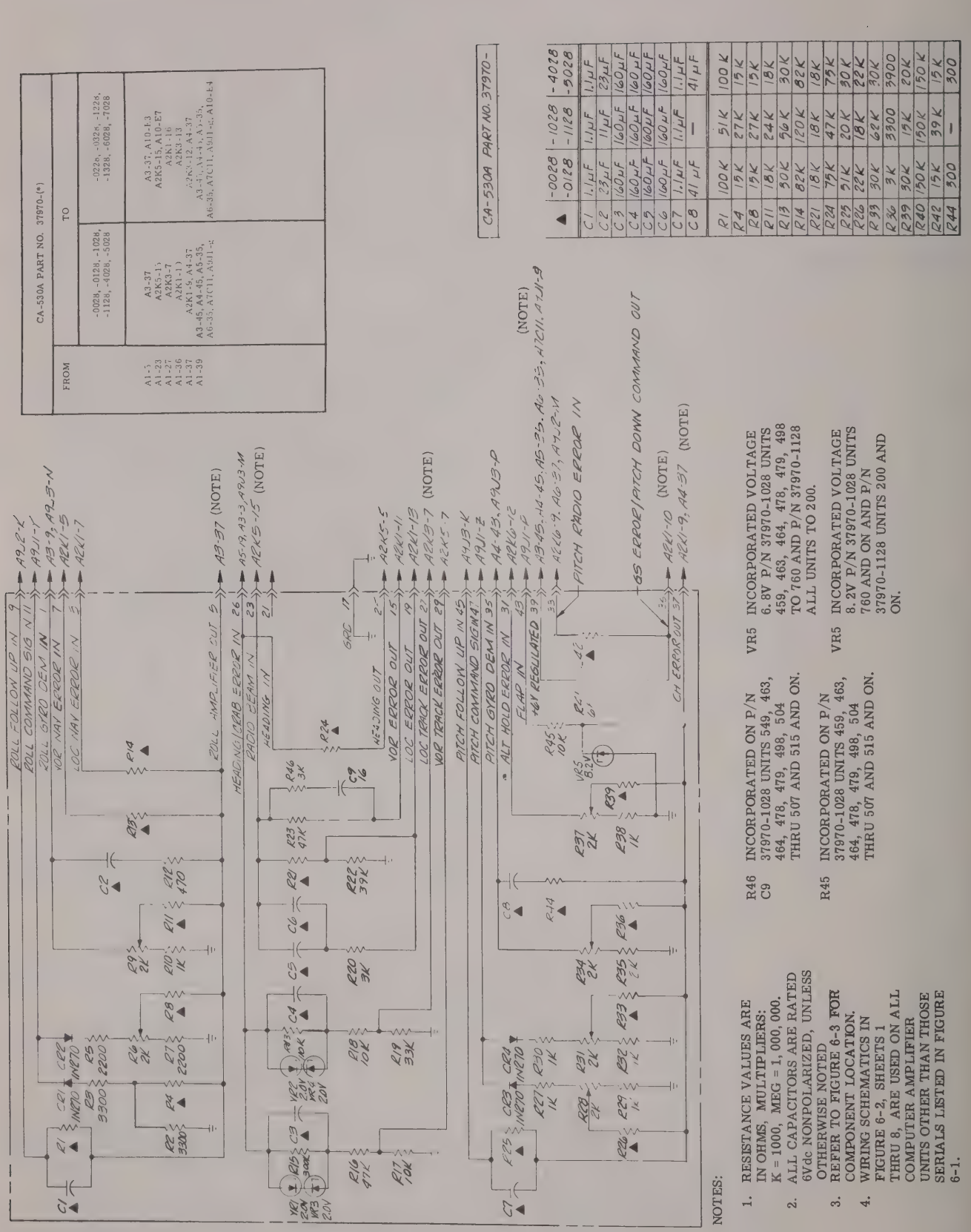
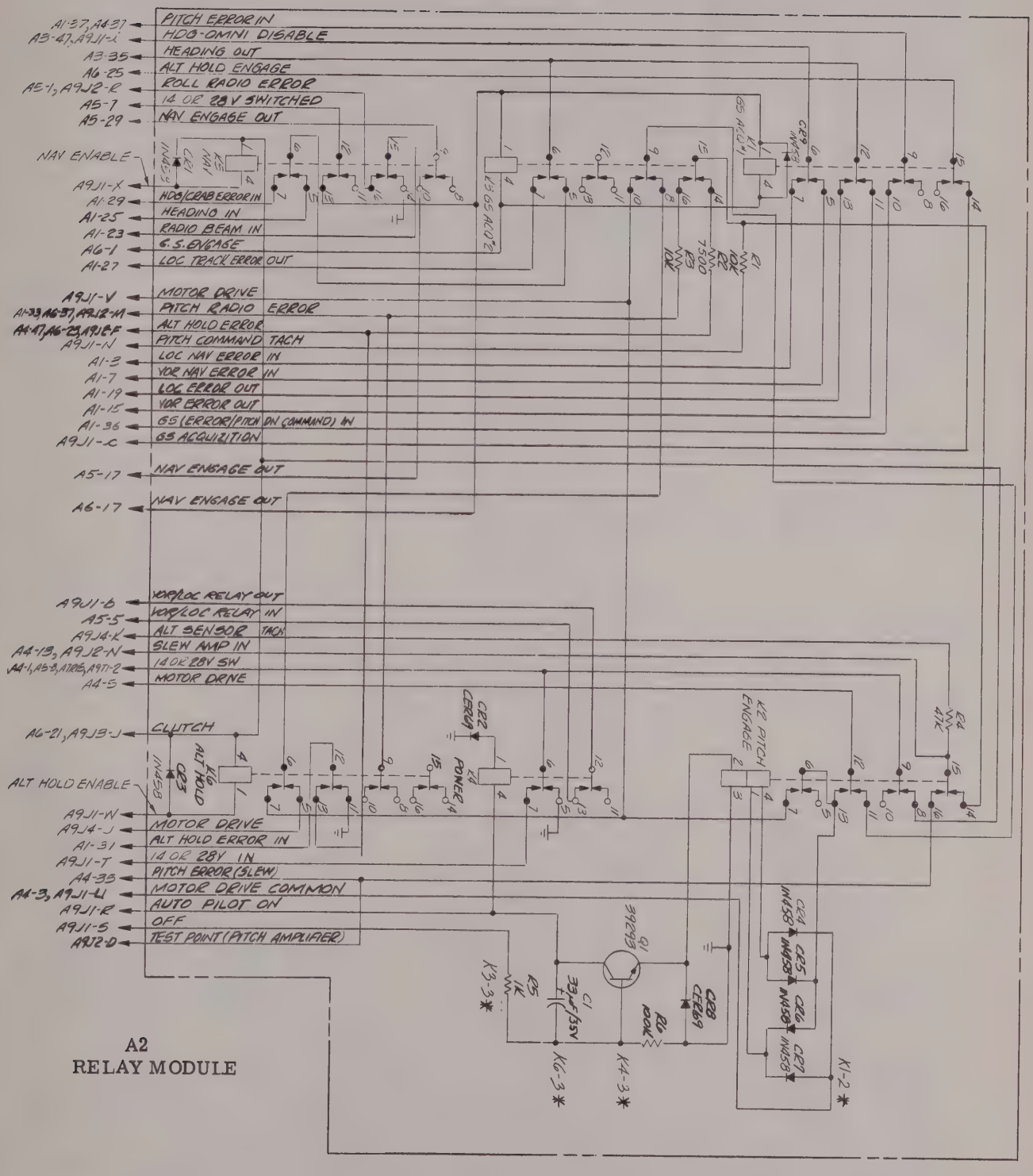


Figure 6-2. CA530A Computer Amplifier Schematic (Sheet 1 of 8)

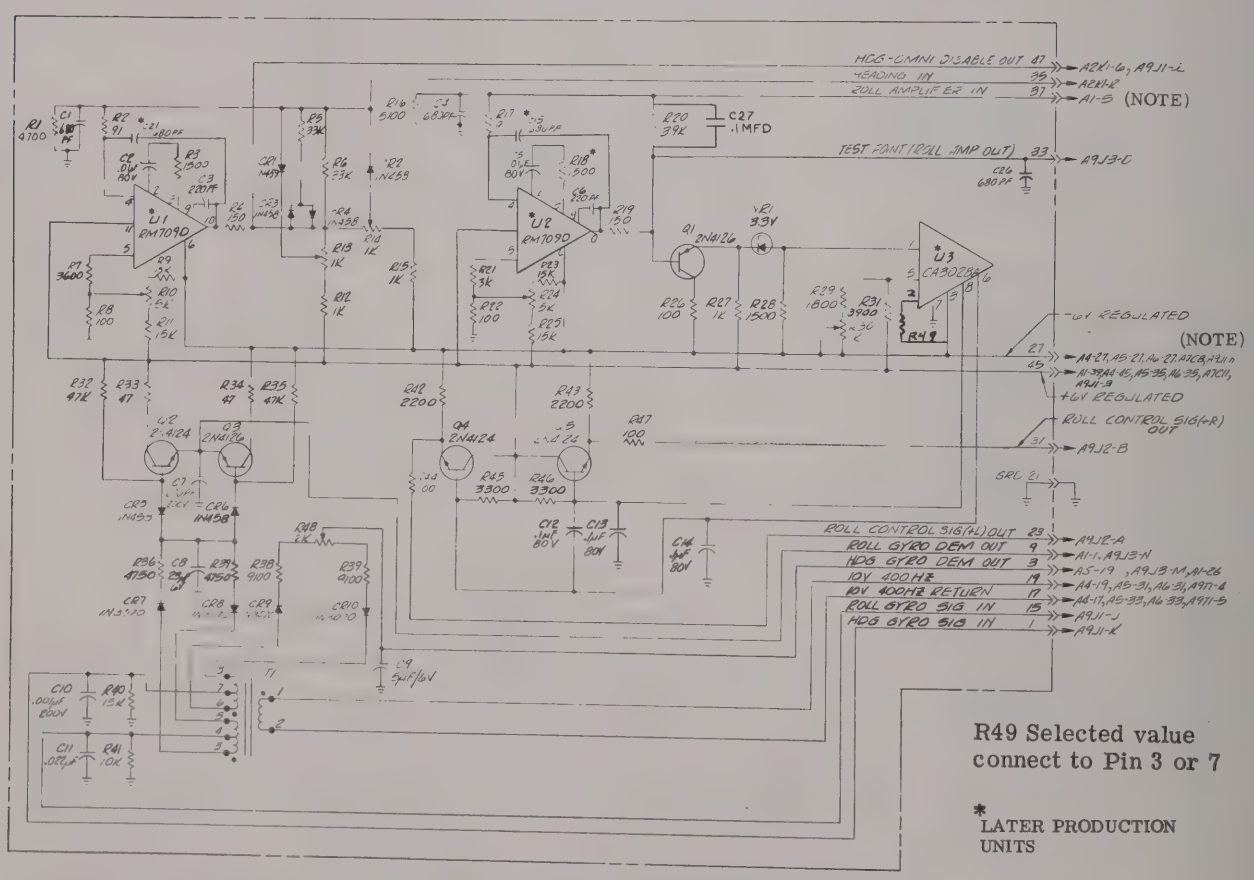


*1974 AND ON PRODUCTION UNITS

NOTE: Relay terminal marked (*) are used as a tie point only.

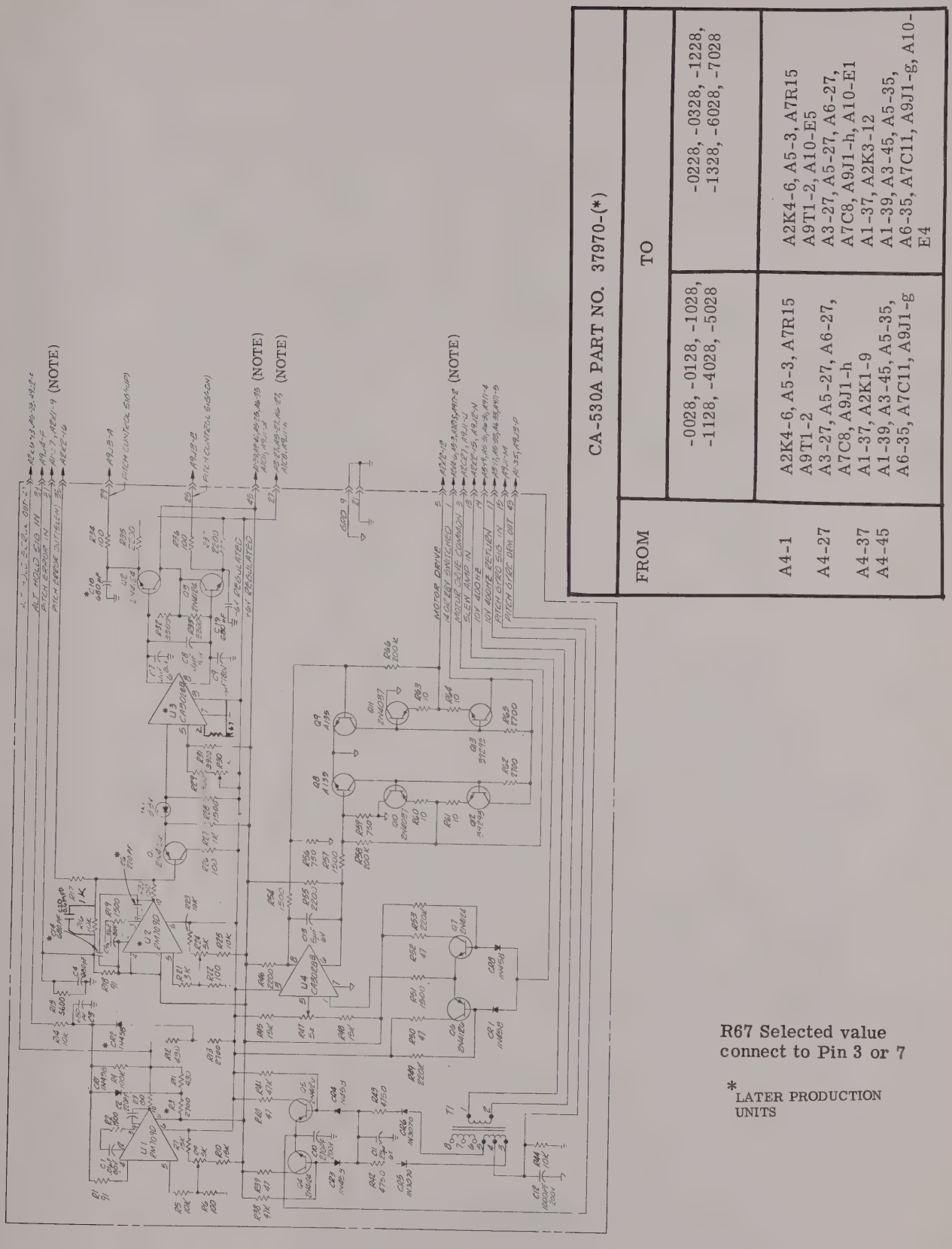
Figure 6-2. CA530A Computer Amplifier Schematic (Sheet 2)

CA-530A PART NO. 37970-(*)		
FROM	TO	
	-0028, -0128, -1028 -1128, -4028, -5028	-0228, -0328, -1228, -1328, -6028, -7028
A3-27	A4-27, A5-27, A6-27, A7C8, A9J1-h	A4-27, A5-27, A6-27, A7C8, A9J1-h, A10-E1
A3-37	A1-5	A1-5, A10-E3
A3-45	A1-39, A4-45, A5-35, A6-35, A7C11, A9J1-g	A1-39, A4-45, A5-35, A6-35, A7C11, A9J1-g, A10-E4



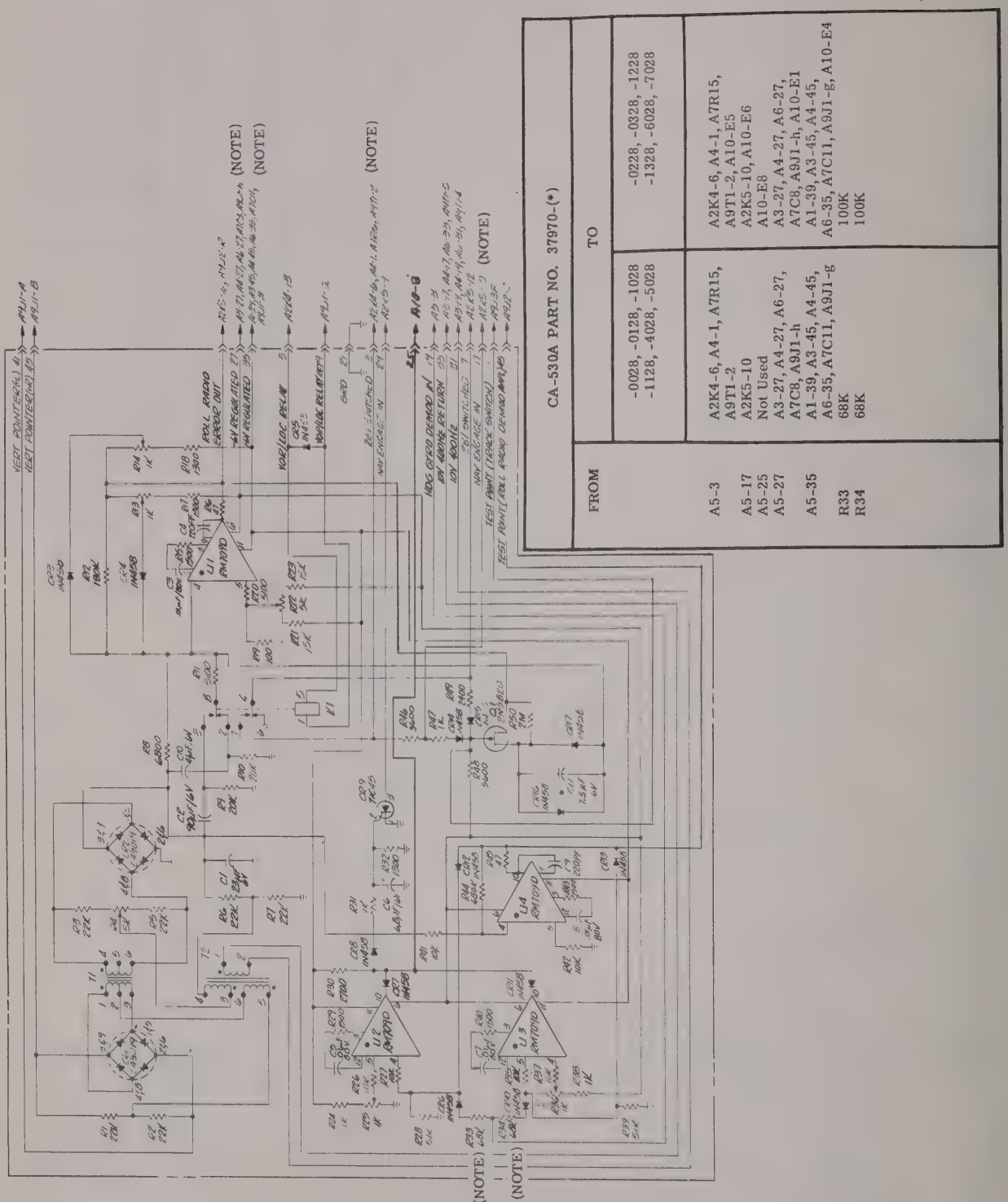
A3
ROLL MODULE

Figure 6-2. CA530A Computer Amplifier Schematic (Sheet 3)



A4
PITCH MODULE

Figure 6-2. CA530A Computer Amplifier Schematic (Sheet 4)

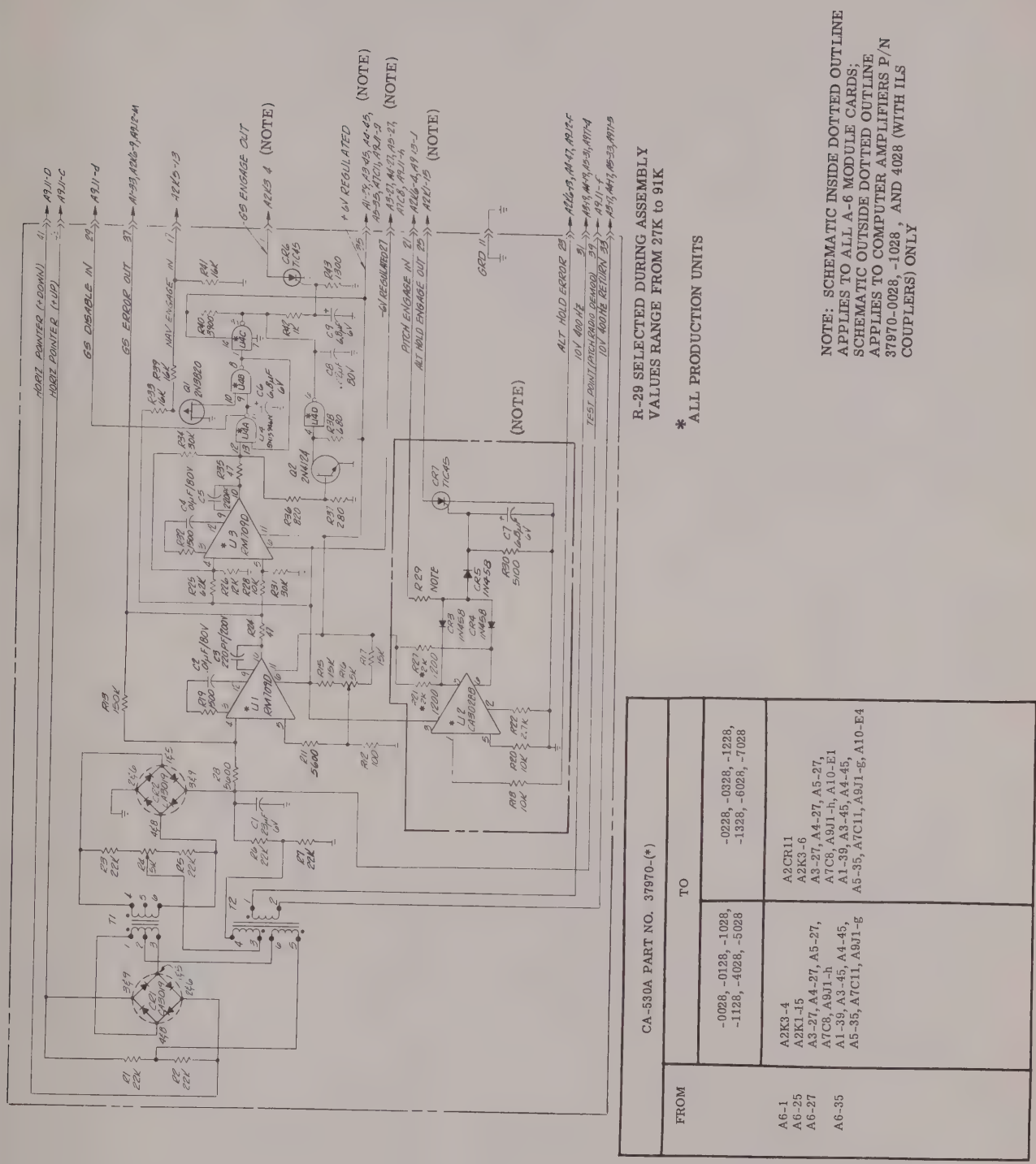


CA-530A PART NO. 37970-(*)		
FROM	TO	
	-0028, -0128, -1028 -1128, -4028, -5028	-0228, -0328, -1228 -1328, -6028, -7028
A5-3	A2K4-6, A4-1, A7R15,	A2K4-6, A4-1, A7R15,
	A9T1-2	A9T1-2, A10-E5
A5-17	A2K5-10	A2K5-10, A10-E6
A5-25	Not Used	A10-E8
A5-27	A3-27, A4-27, A6-27,	A3-27, A4-27, A6-27,
	A7C8, A9J1-h	A7C8, A9J1-h, A10-E1
A5-35	A1-39, A3-45, A4-45,	A1-39, A3-45, A4-45,
	A6-35, A7C11, A9J1-g	A6-35, A7C11, A9J1-g, A10-E4
R33	68K	100K
R34	68K	100K

*C-11 INCORPORATED ON P/N 37970-0028 UNITS 128 AND ON; P/N 37970-1028 UNITS 450 AND ON AND P/N 37970-1128 UNITS 135 AND ON.

A5
ROLL RADIO
MODULE

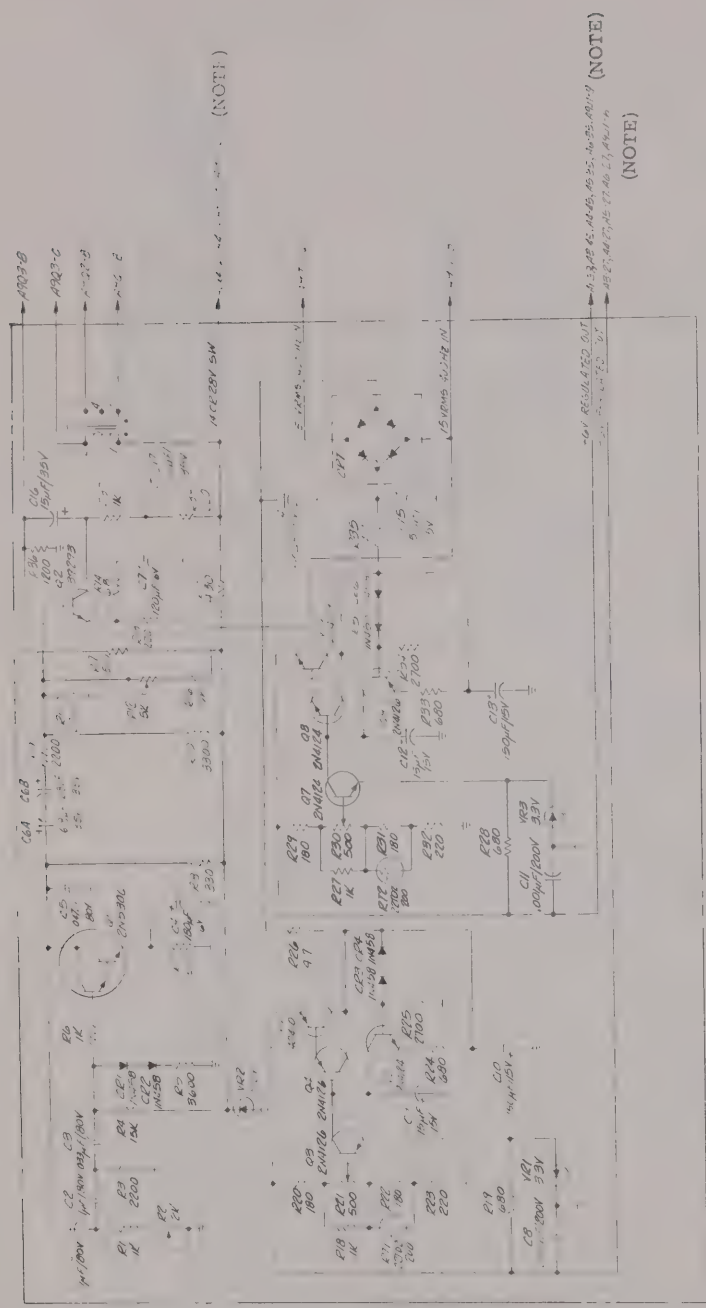
Figure 6-2. CA530A Computer Amplifier Schematic (Sheet 5)



CA-530A PART NO. 37970-(*)		
FROM	TO	
	-0028, -0128, -1028, -1128, -4028, -5028	-0228, -0328, -1228, -1328, -6028, -7028
A6-1	A2K3-4	A2CR11
A6-25	A2K1-15	A2K3-6
A6-27	A3-27, A4-27, A5-27, A7C8, A9J1-h	A3-27, A4-27, A5-27, A7C8, A9J1-h, A10-E1
A6-35	A1-39, A3-45, A4-45, A5-35, A7C11, A9J1-g	A1-39, A3-45, A4-45, A5-35, A7C11, A9J1-g, A10-E4

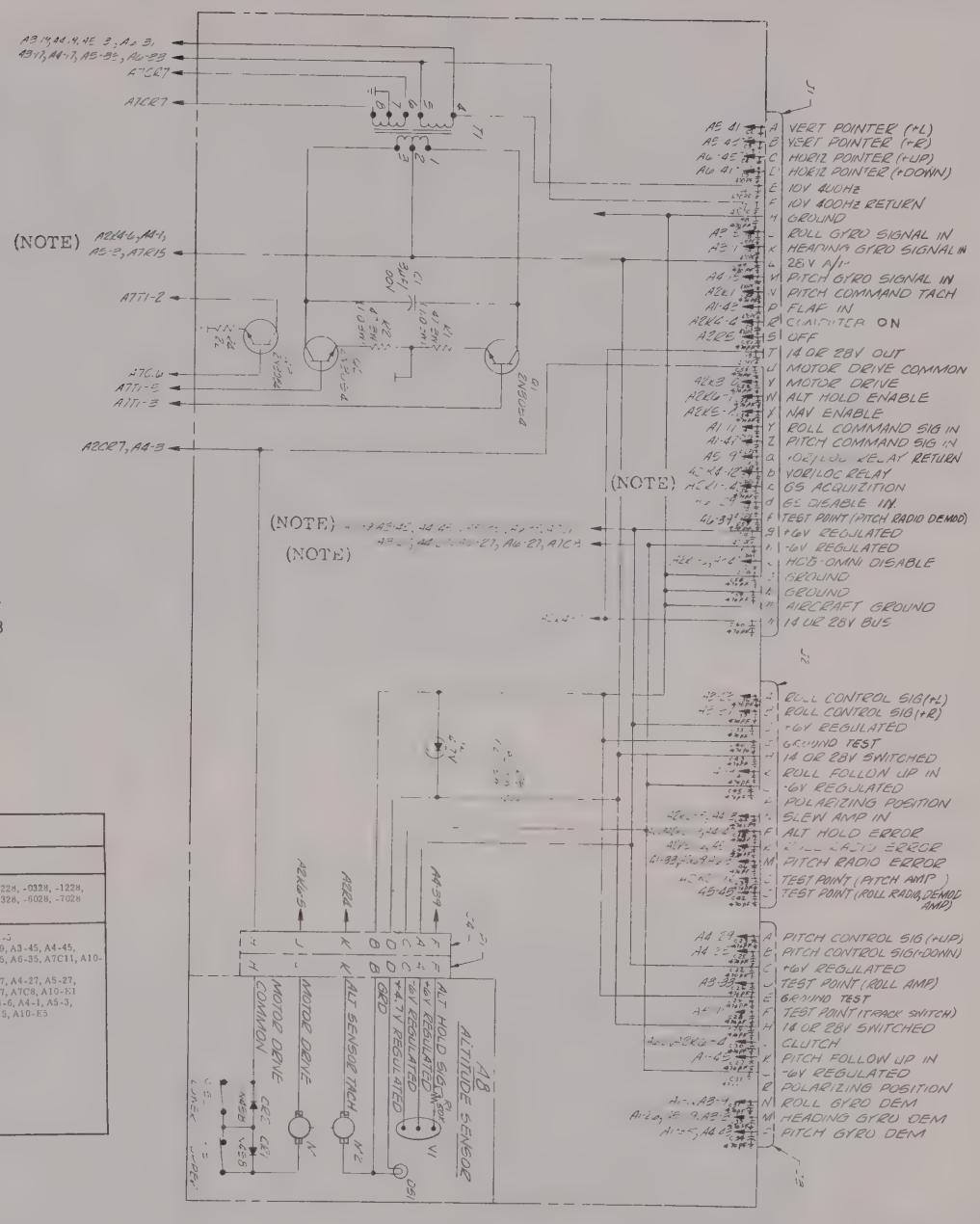
A6
PITCH RADIO
MODULE

Figure 6-2. CA530A Computer Amplifier Schematic (Sheet 6)



CA-530A PART NO. 37970-(*)		
FROM	TO	
	-0028, -0128, -1028, -1128, -4028, -5028	-0228, -0328, -1228, -1328, -6028, -7028
A7C8 A7C11 A7K15	A3-27, A4-27, A5-27, A6-27, A9J1-h A1-39, A3-45, A4-45, A5-35, A6-35, A9J1-g A2K4-6, A4-1, A5-3, A9T1-2	A3-27, A4-27, A5-27, A6-27, A9J1-h, A10-E1 A1-39, A3-45, A4-45, A5-35, A6-35, A9J1-g, A10-E4 A2K4-6, A4-1, A5-3, A9T1-2, A10-E5

Figure 6-2. CA530A Computer Amplifier Schematic (Sheet 7)



NOTE:

C3 THRU C-60 INCORPORATED P/N 37970-0028 UNITS 148 AND UP; P/N 37970-1028 UNITS 549 AND UP; P/N 37970-1128 UNITS 150 AND UP;

CA-530A PART NO. 37970-(*)		
FROM	TO	
	-0028, -0128, -1028, -1128, -4028, -5028	-0228, -0328, -1228, -1328, -6028, -7028
A9J1-c A9J1-e	A2K1-14 A1-39, A3-45, A4-45, A5-35, A6-35, A7C11	A2K3-5 A1-39, A3-45, A4-45, A5-35, A6-35, A7C11, A10-E4
A9J1-h A9T1-2	A3-27, A4-27, A5-27, A6-27, A7C8 A2K4-6, A4-1, A5-3, A7R15	A3-27, A4-27, A5-27, A6-27, A7C8, A10-E1 A2K4-6, A4-1, A5-3, A7R15, A10-E5

CHASSIS
A9

Figure 6-2. CA530A Computer Amplifier Schematic (Sheet 8)

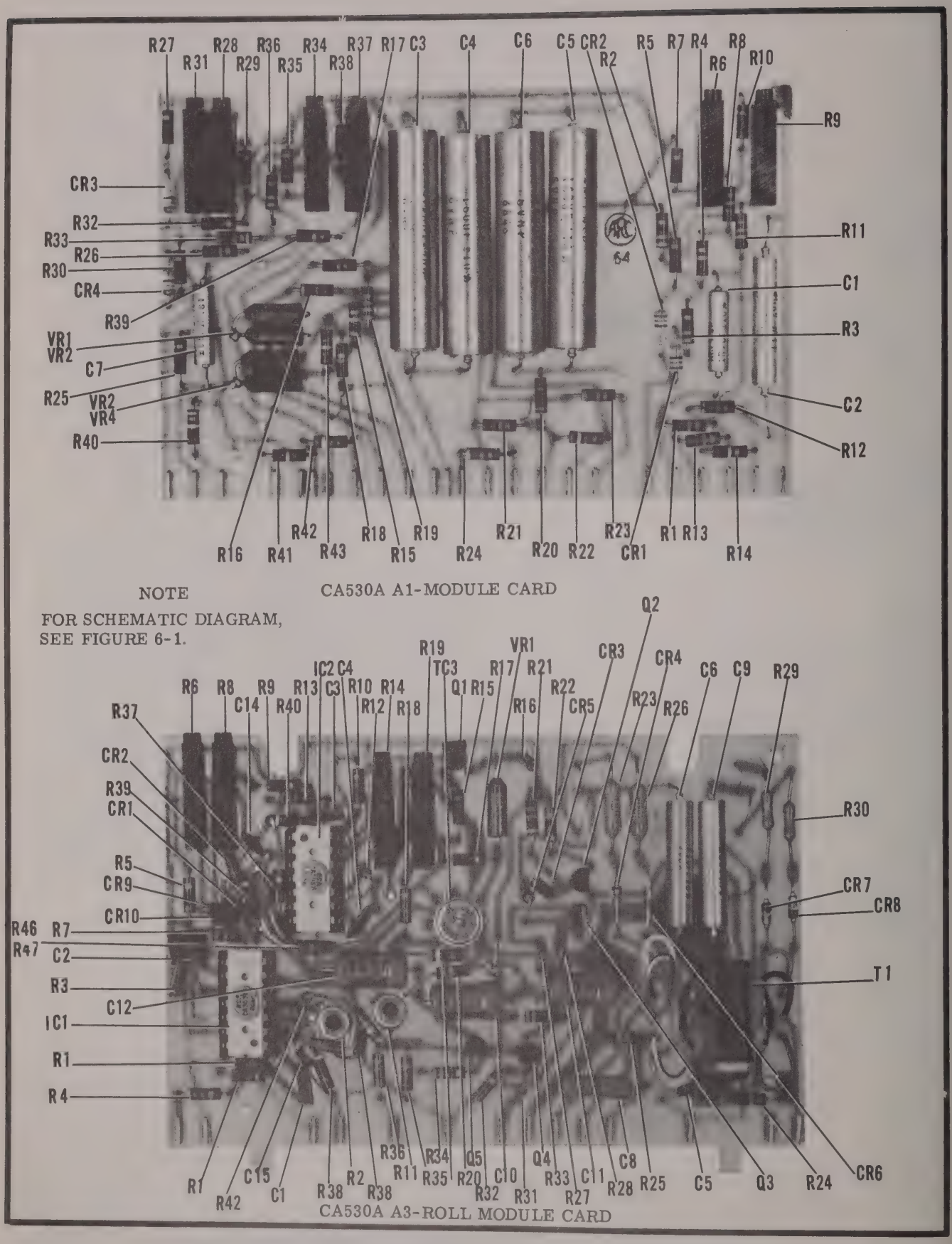


Figure 6-3. CA530A Computer Amplifier Wiring Diagram (Sheet 1 of 10)

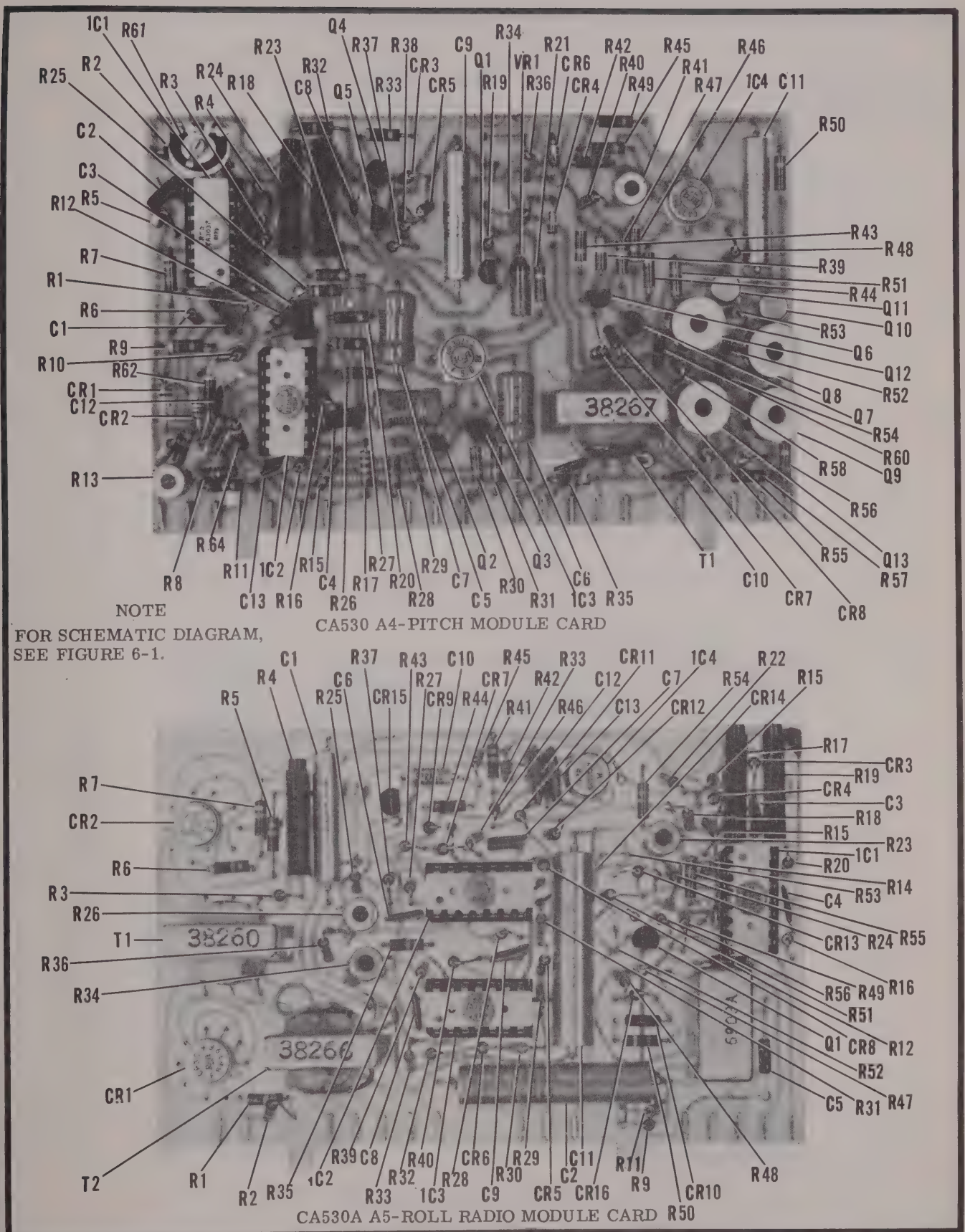
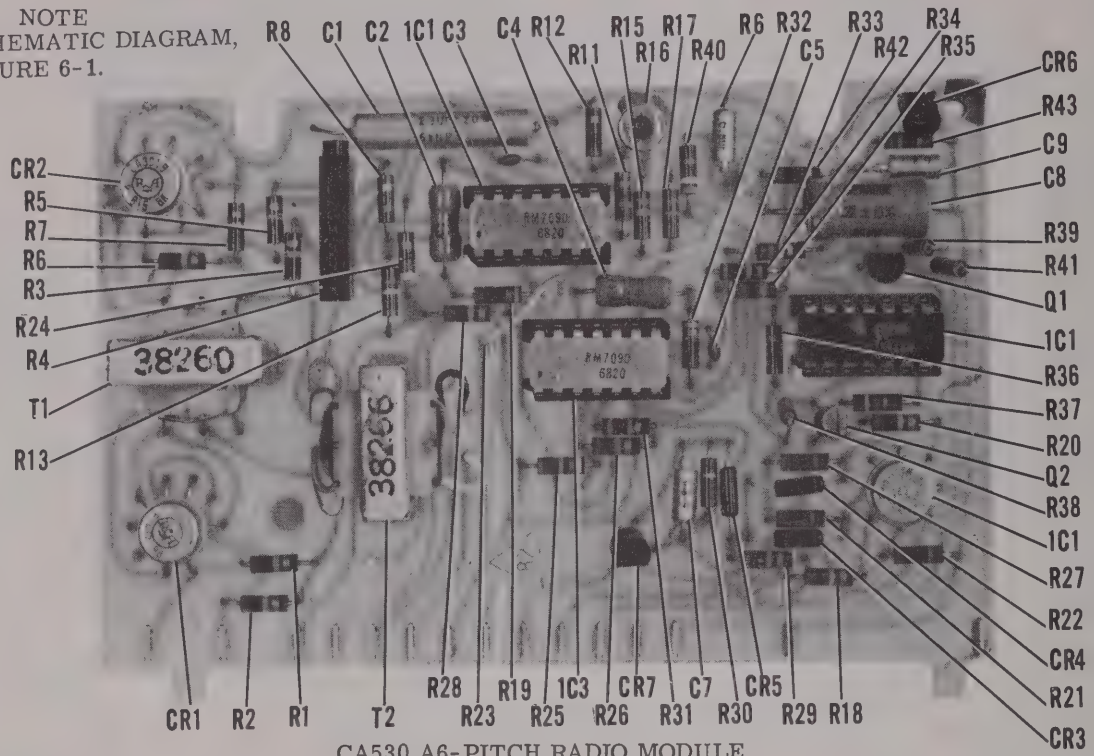
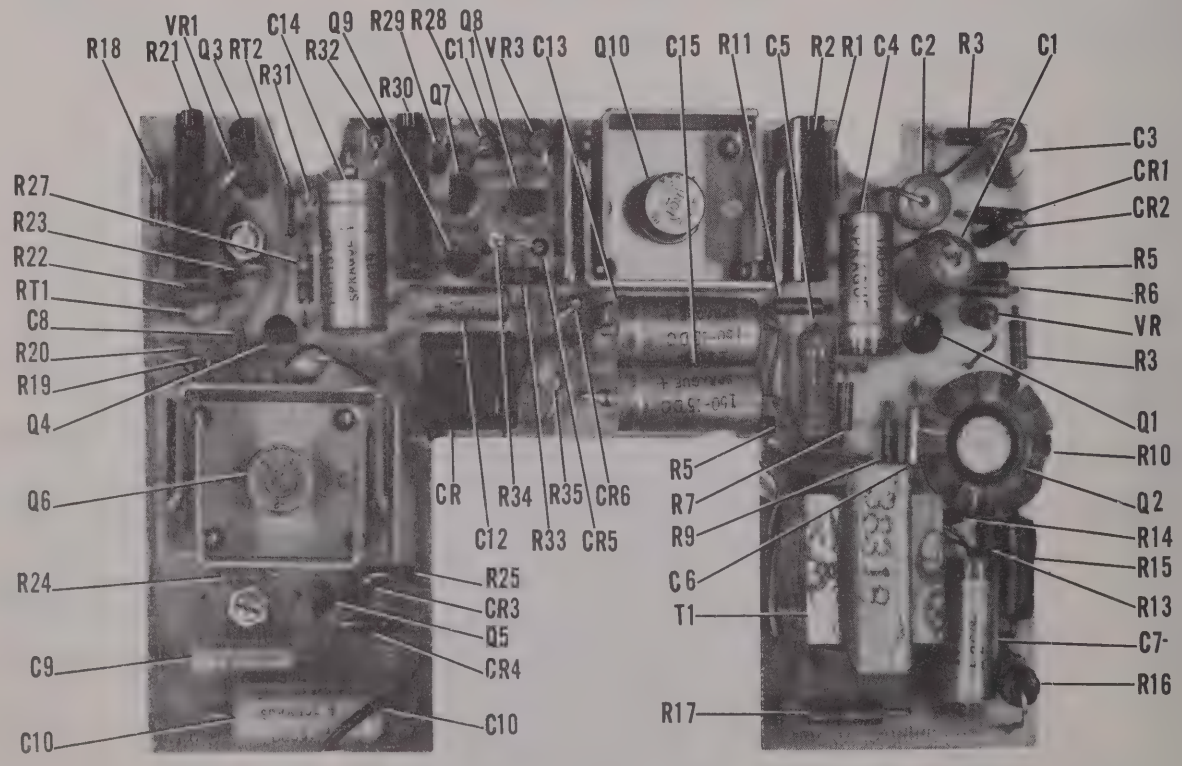


Figure 6-3. CA530A Computer Amplifier Wiring Diagram (Sheet 2)

NOTE
FOR SCHEMATIC DIAGRAM, SEE FIGURE 6-1.

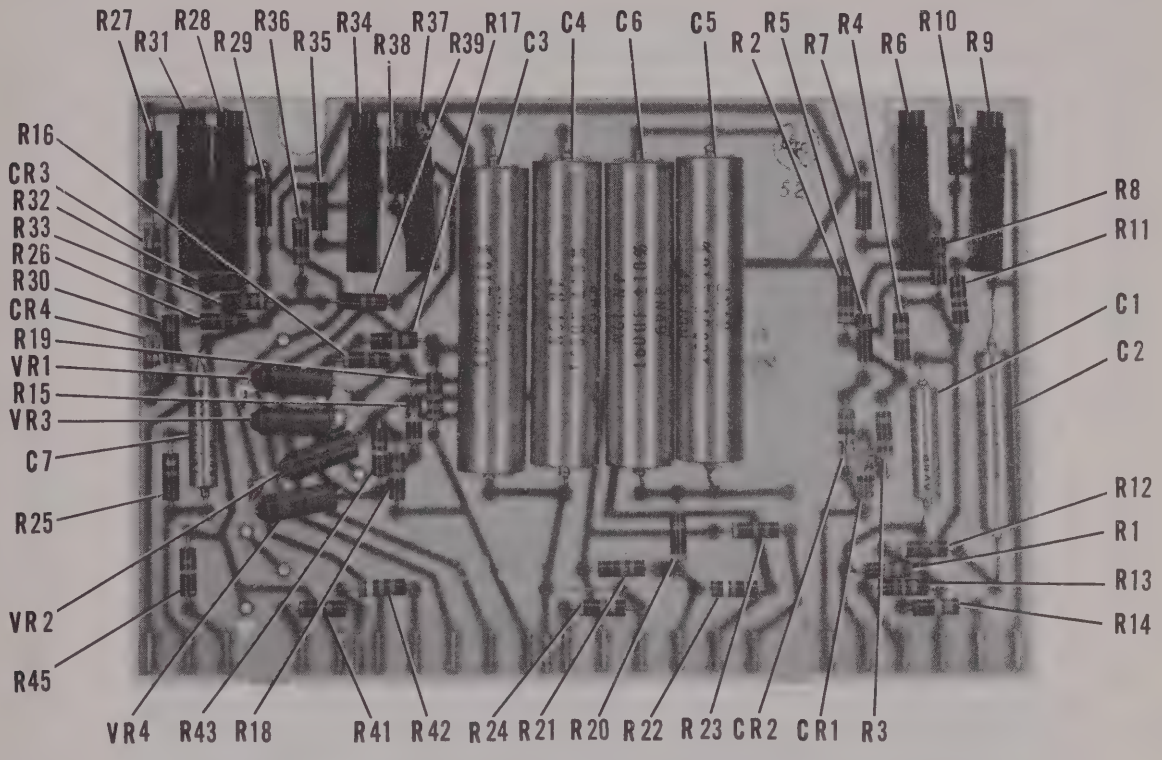


CA530 A6-PITCH RADIO MODULE



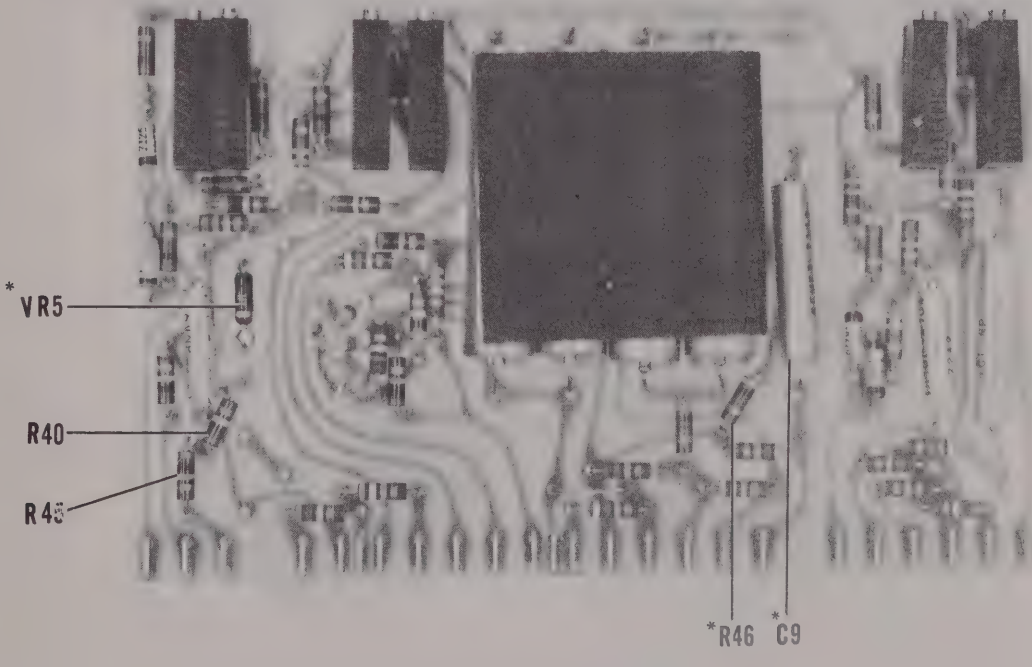
CA530 A7-POWER SUPPLY MODULE

Figure 6-3. CA530A Computer Amplifier Wiring Diagram (Sheet 3)



NOTE: FOR SCHEMATIC DIAGRAM SEE FIGURE 6-2.

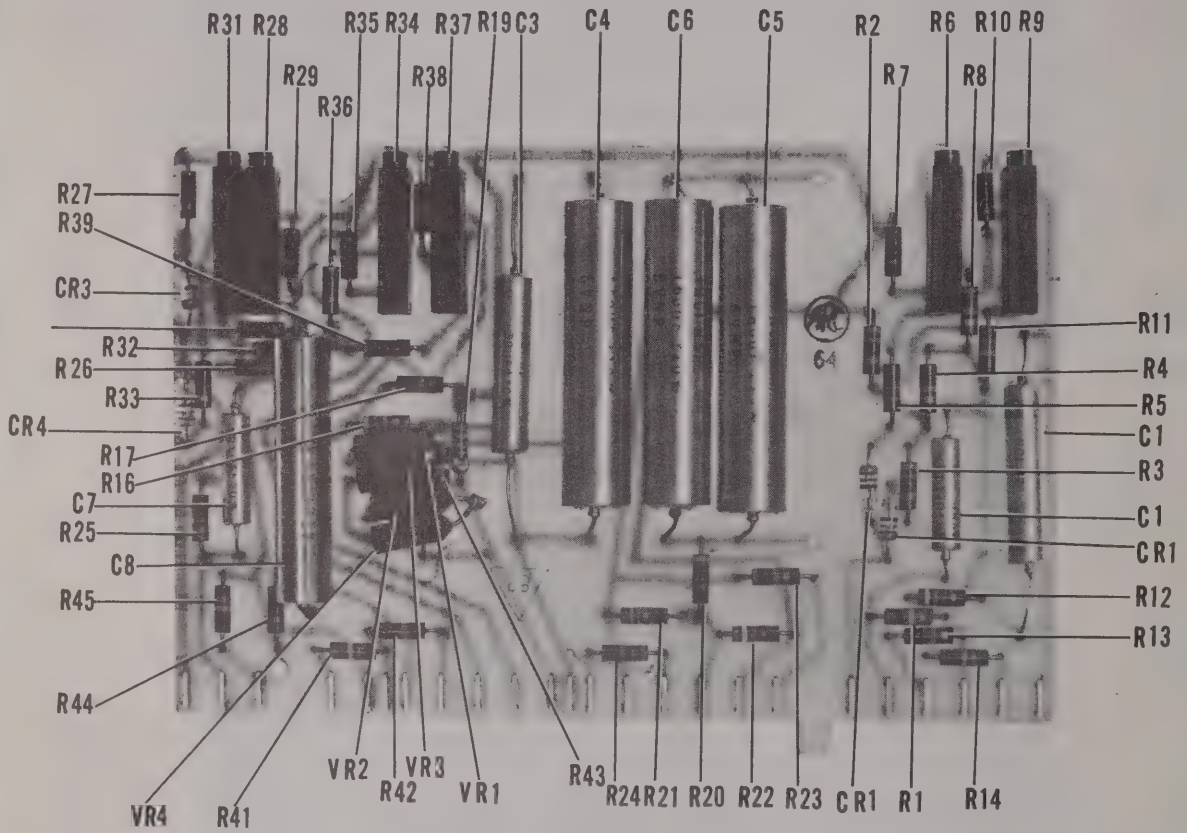
CA530A A1-MODULE CARD



CA530A A1-MODULE CARD

*Added Component Refer to Figure 6-2. Sheet 1 for Serialization

Figure 6-3. CA530A Computer Amplifier Wiring Diagram (Sheet 4)

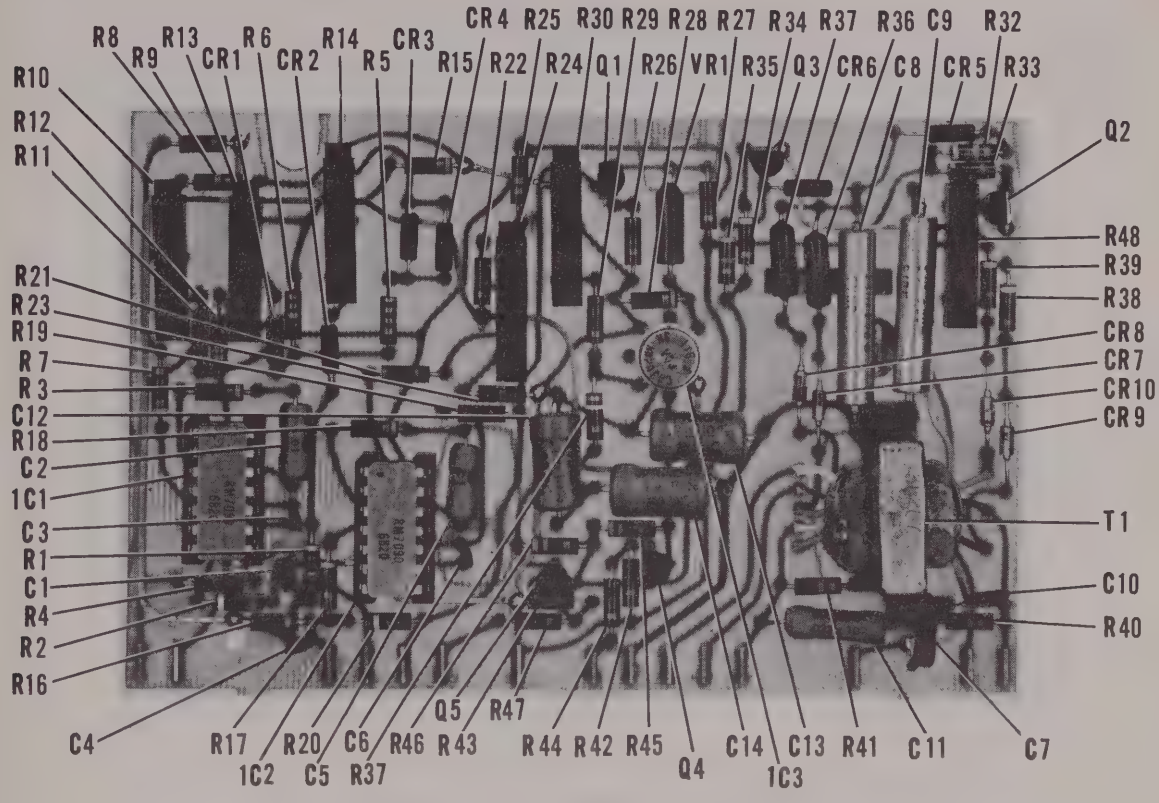


CA530A A1-MODULE CARD

USED WITH P/N 37970-0028 AND P/N 37970-0128

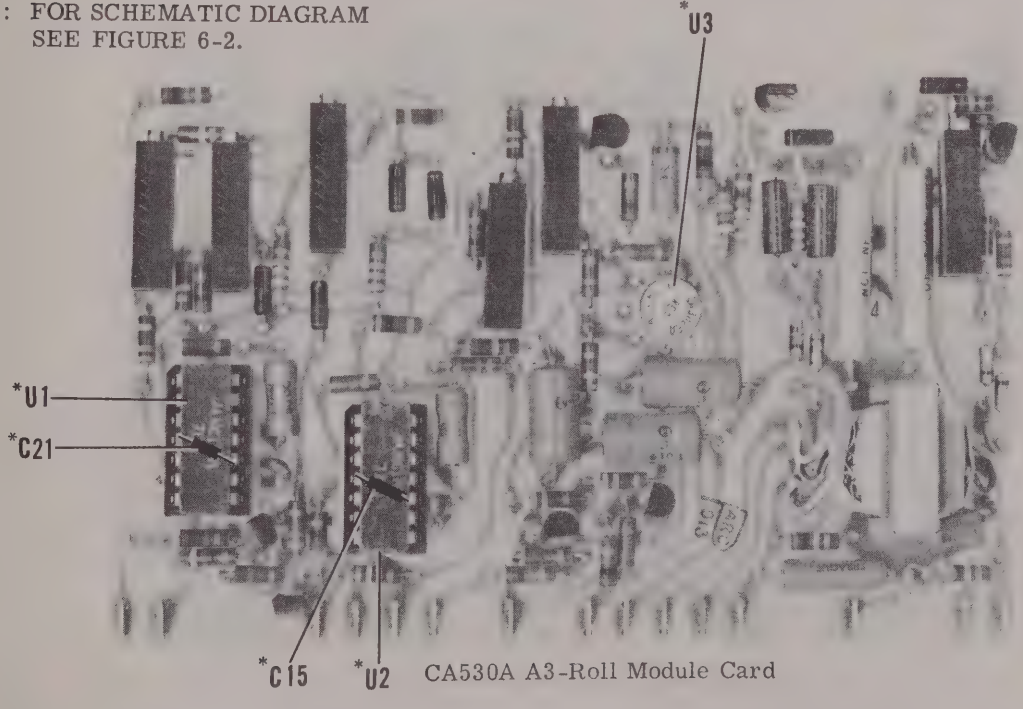
NOTE: FOR SCHEMATIC DIAGRAM
SEE FIGURE 6-2.

Figure 6-3. CA530A Computer Amplifier Wiring Diagram (Sheet 5)



CA530A A3-ROLL MODULE CARD

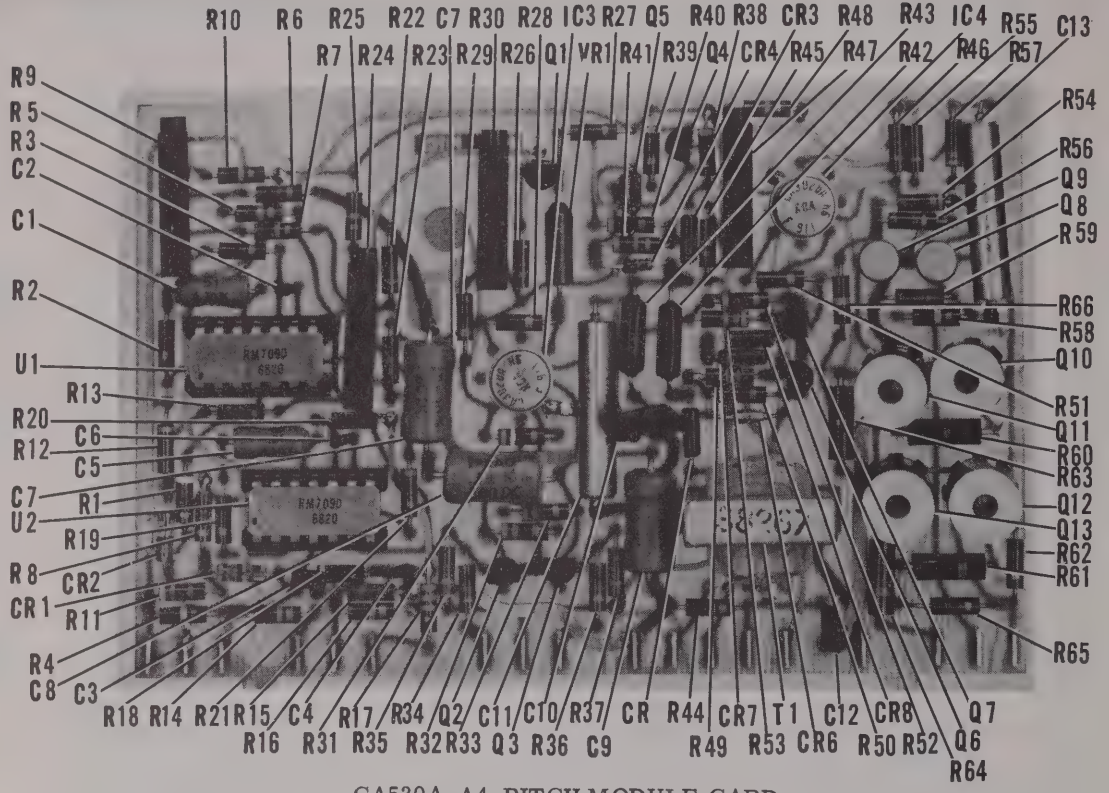
NOTE: FOR SCHEMATIC DIAGRAM SEE FIGURE 6-2.



CA530A A3-Roll Module Card

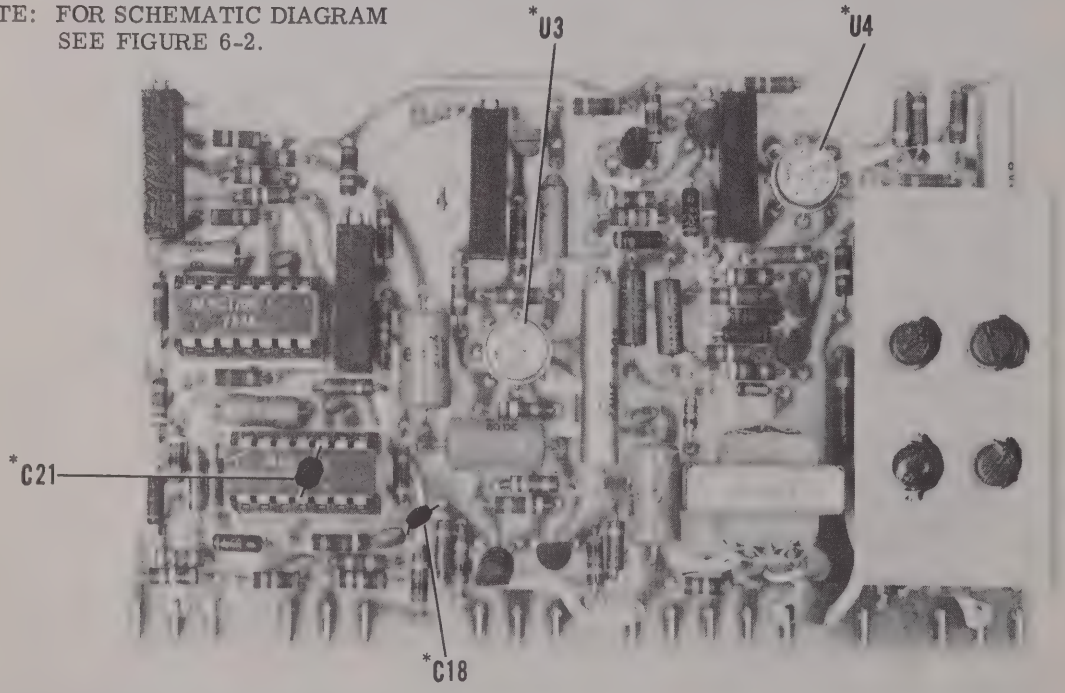
*Added Component Refer to Figure 6-2. Sheet 3 for Serialization

Figure 6-3. CA530A Computer Amplifier Wiring Diagram (Sheet 6)



CA530A A4-PITCH MODULE CARD

NOTE: FOR SCHEMATIC DIAGRAM SEE FIGURE 6-2.

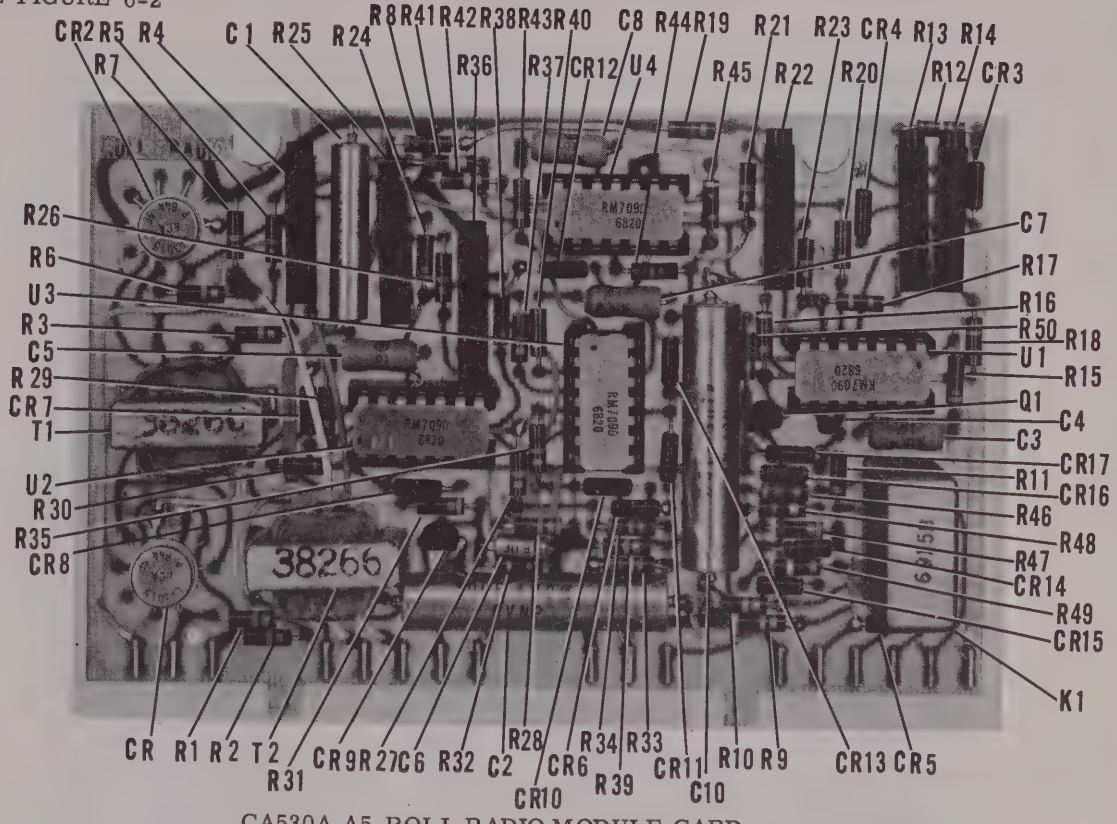


CA530A A4-Pitch Module Card

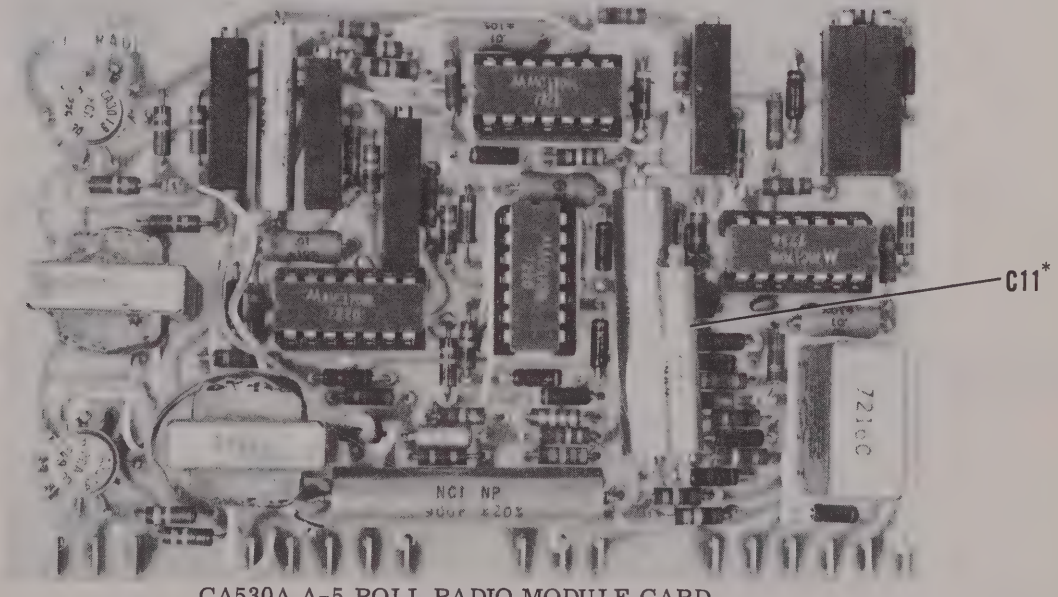
*Added Component Refer to Figure 6-2. Sheet 4 for Serialization

Figure 6-3. CA530A Computer Amplifier Wiring Diagram (Sheet 7)

NOTE: FOR SCHEMATIC DIAGRAM, SEE FIGURE 6-2



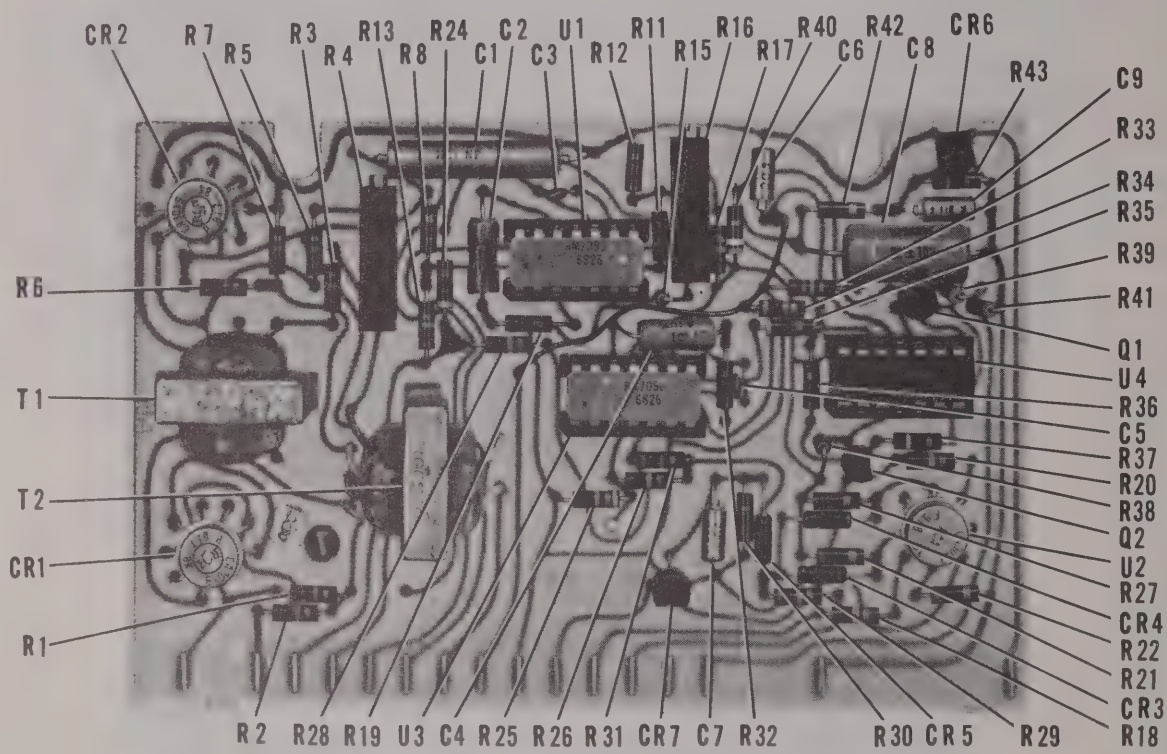
CA530A A5-ROLL RADIO MODULE CARD



CA530A A-5 ROLL RADIO MODULE CARD

* Added Component Refer to Figure 6-2. Sheet 5 for Serialization

Figure 6-3. CA530A Computer Amplifier Wiring Diagram (Sheet 8)

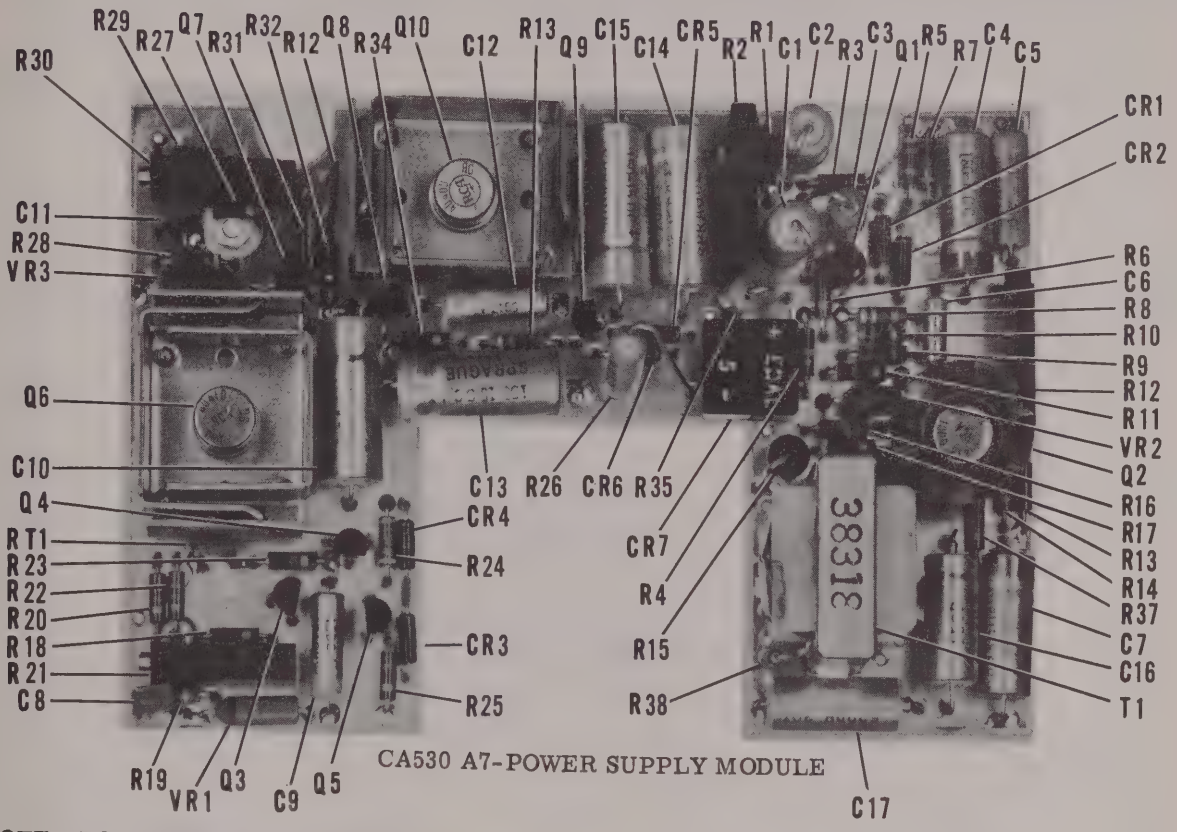


CA530 A6-PITCH RADIO MODULE

NOTE: FOR SCHEMATIC DIAGRAM, SEE FIGURE 6-2.

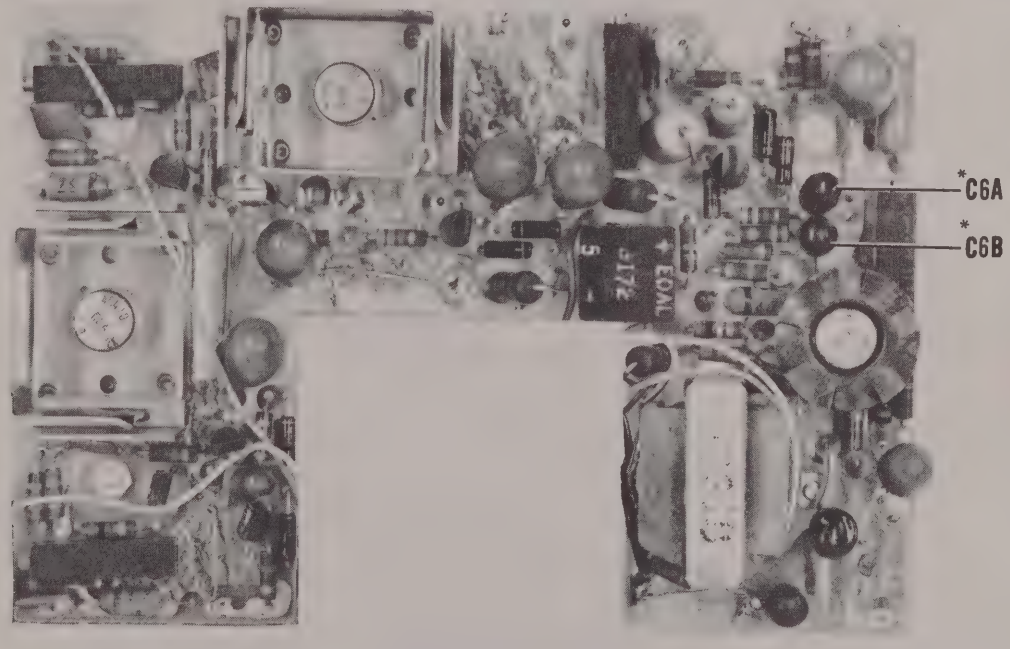
R-29 SELECTED DURING ASSEMBLY VALUES RANGE FROM 27K TO 29K

Figure 6-3. CA530A Computer Amplifier Wiring Diagram (Sheet 9)



CA530 A7-POWER SUPPLY MODULE

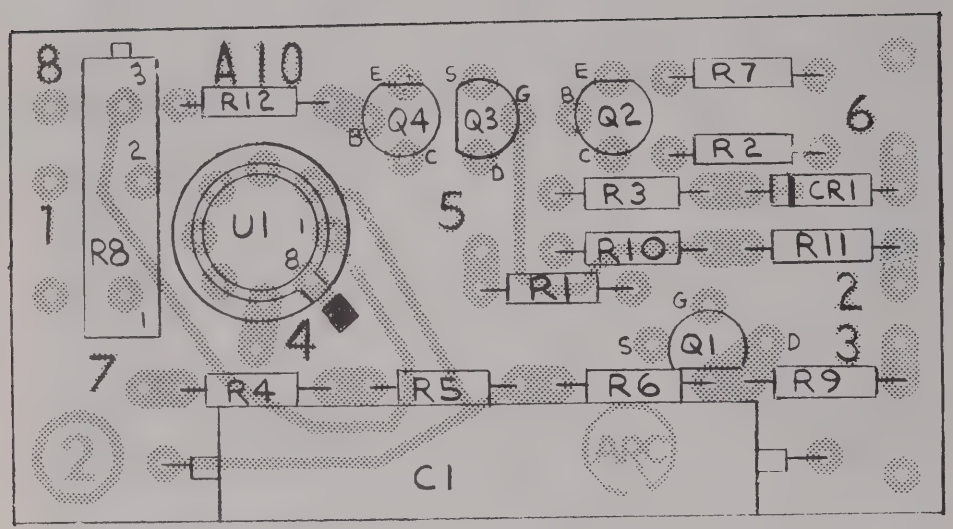
NOTE: FOR SCHEMATIC DIAGRAM
SEE Figure 6-2.



CA530A A-7 POWER SUPPLY MODULE

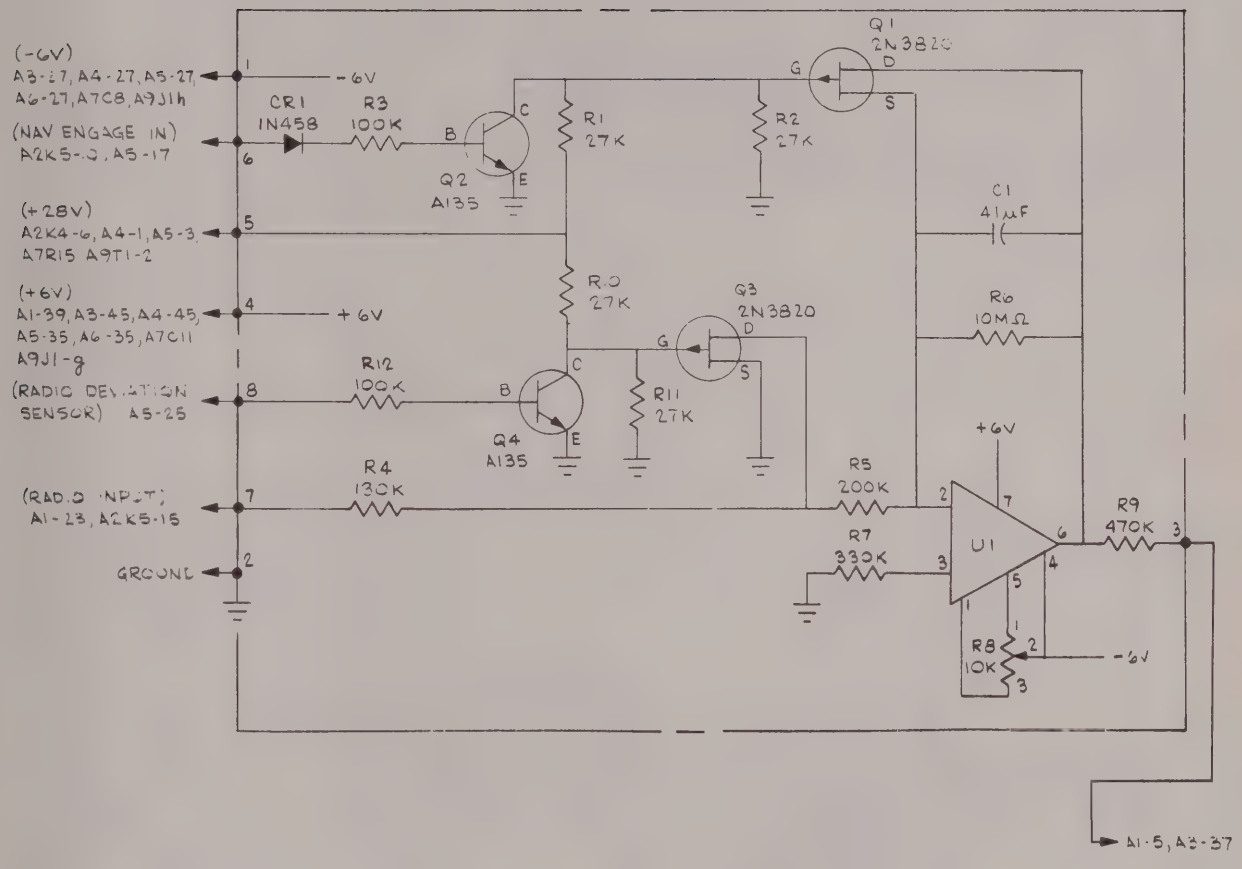
*Added Component Refer to Figure 6-2. Sheet 7 for Serialization

Figure 6-3. CA530A Computer Amplifier Wiring Diagram (Sheet 10)



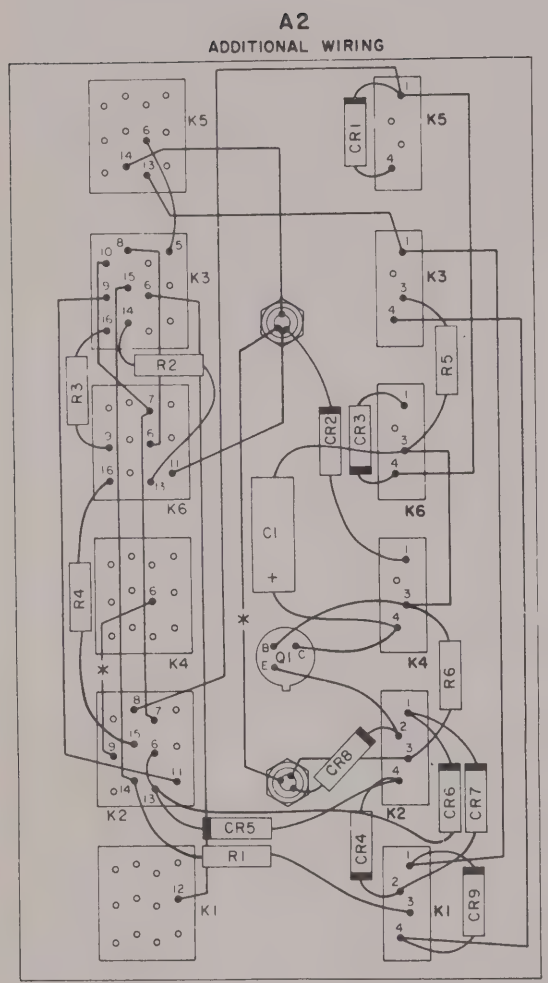
1974 AND ON
PRODUCTION UNITS

Figure 6-3A CA530A Computer Amplifier, A10 Crosswind Integrator Module, Wiring Diagram



1974 AND ON
PRODUCTION UNITS

Figure 6-3B CA530 Computer Amplifier, A10 Crosswind Integrator Module, Wiring Schematic



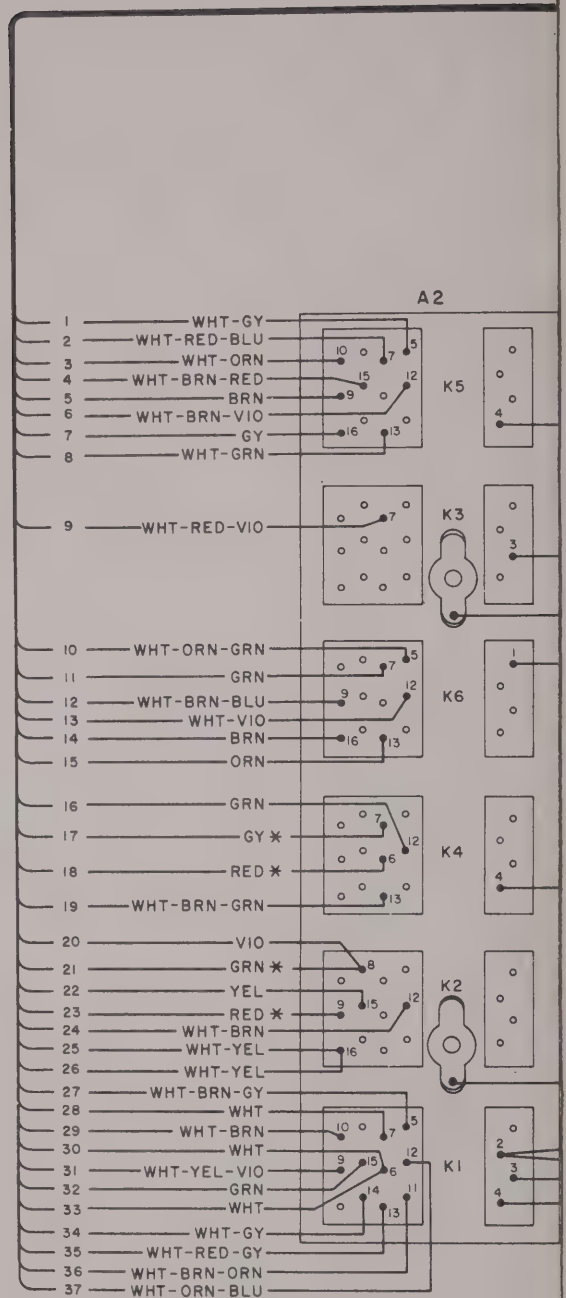
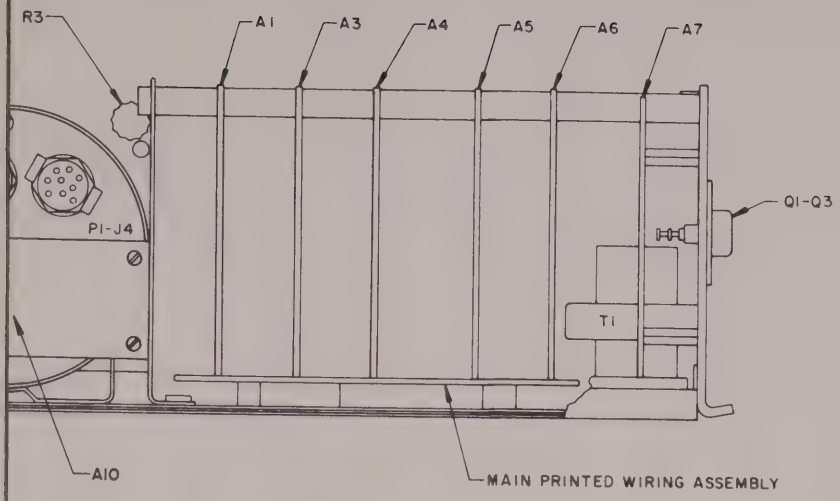


Figure 6-4. CA530 Computer Amplifier Main Wiring Diagr



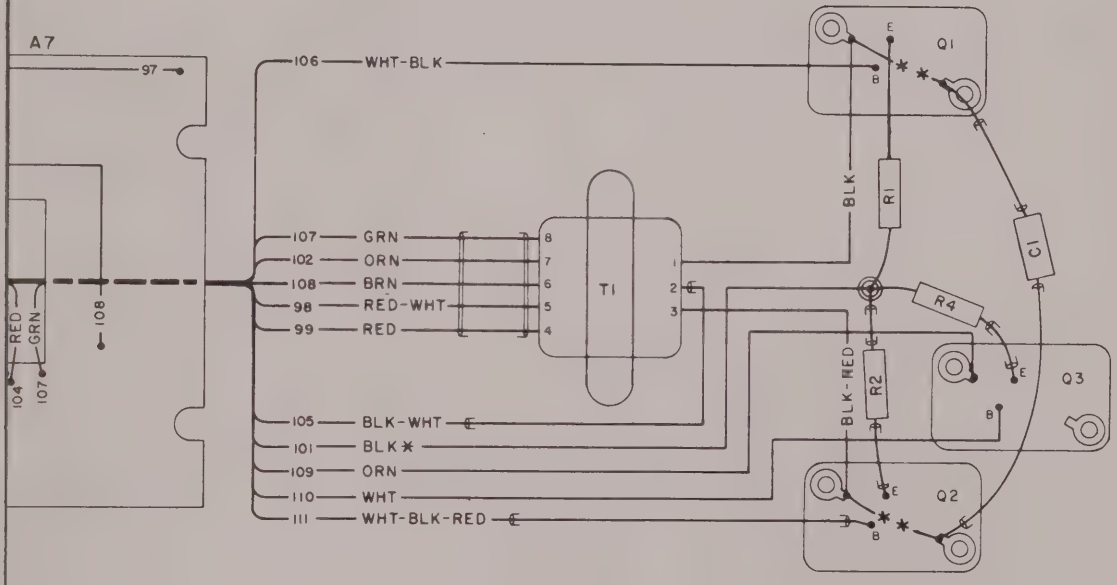


Figure 6-4A CA530 Computer Ampifier Main Wiring Diagram

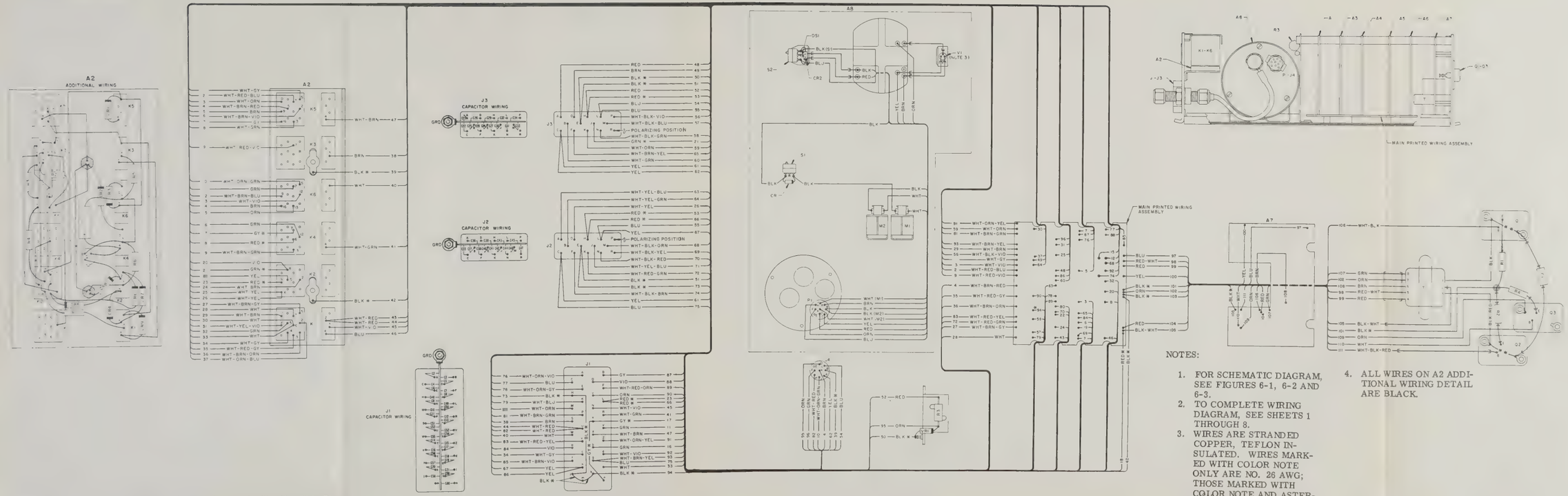


Figure 6-4. CA530 Computer Amplifier Main Wiring Diagram

NOTES:

1. FOR SCHEMATIC DIAGRAM, SEE FIGURES 6-1, 6-2 AND 6-3.
2. TO COMPLETE WIRING DIAGRAM, SEE SHEETS 1 THROUGH 8.
3. WIRES ARE STRANDED COPPER, TEFLON INSULATED. WIRES MARKED WITH COLOR NOTE ONLY ARE NO. 26 AWG; THOSE MARKED WITH COLOR NOTE AND ASTERISK ARE NO. 20 AWG.
4. ALL WIRES ON A2 ADDITIONAL WIRING DETAIL ARE BLACK.

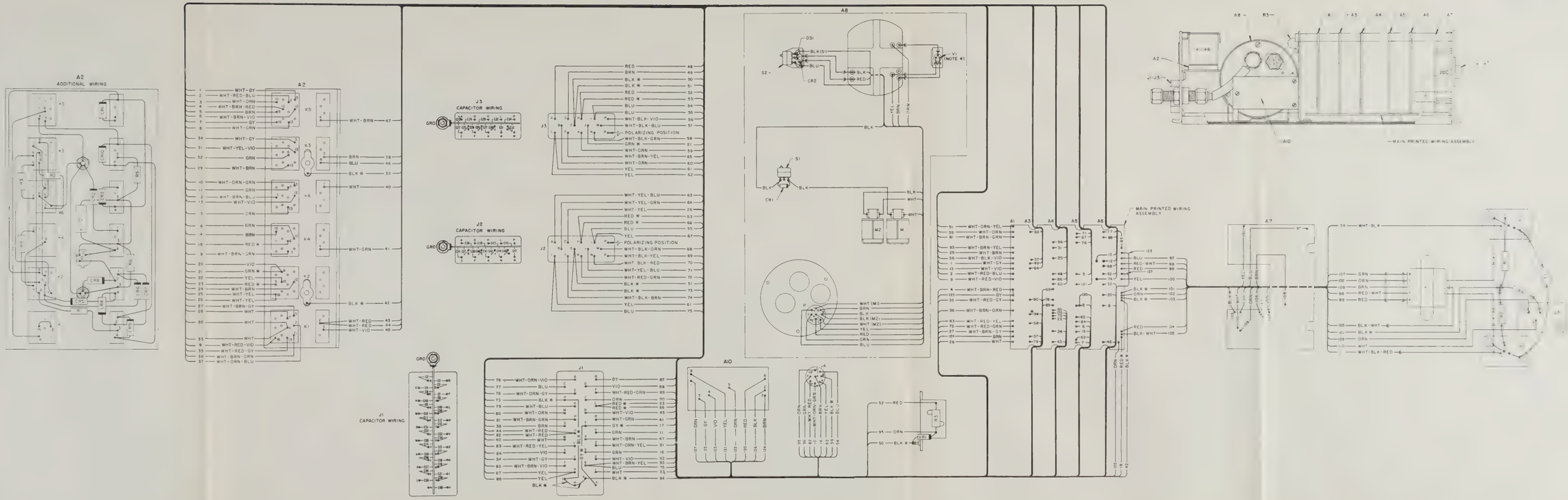


Figure 6-4A CA530 Computer Amplifier Main Wiring Diagram

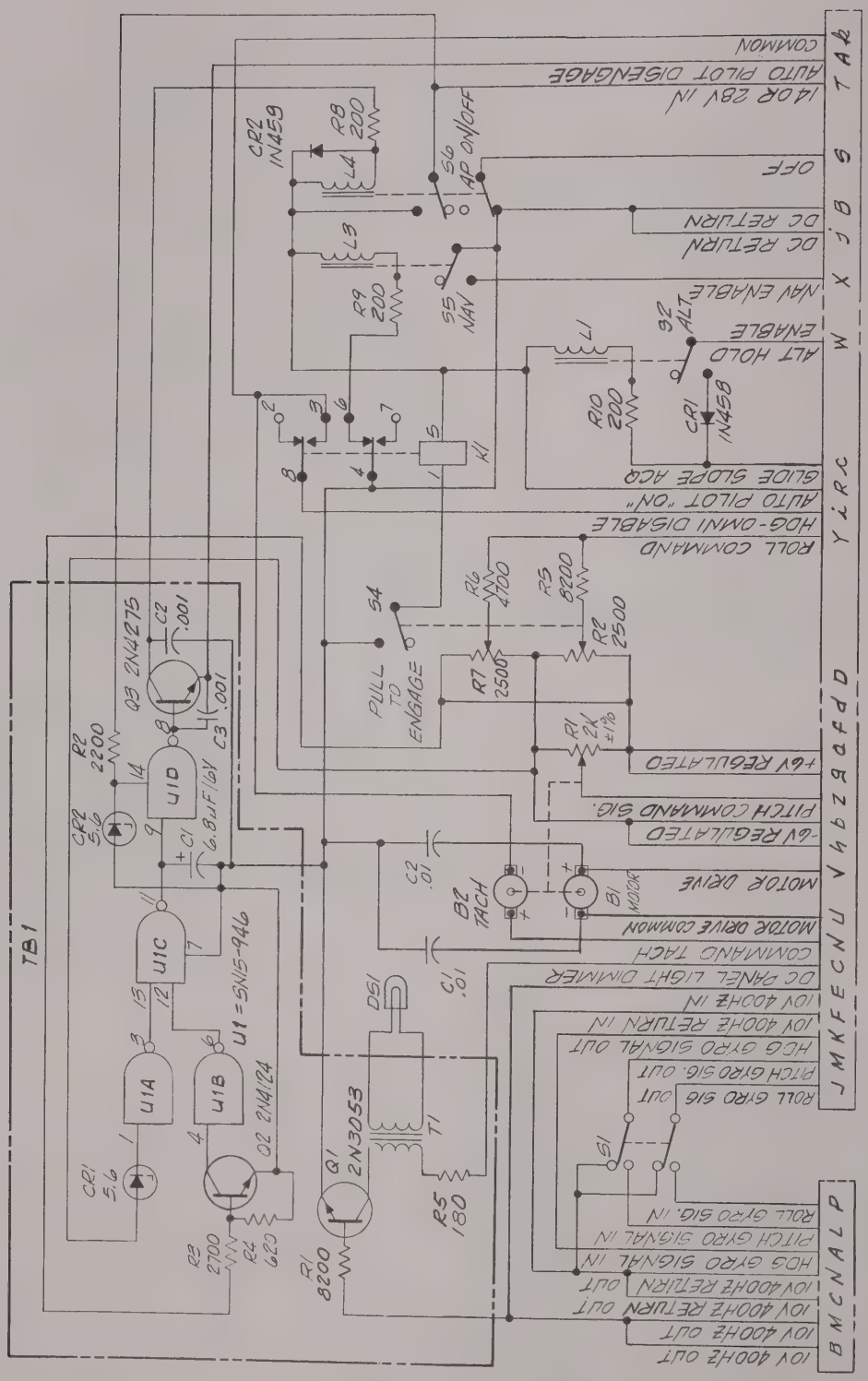
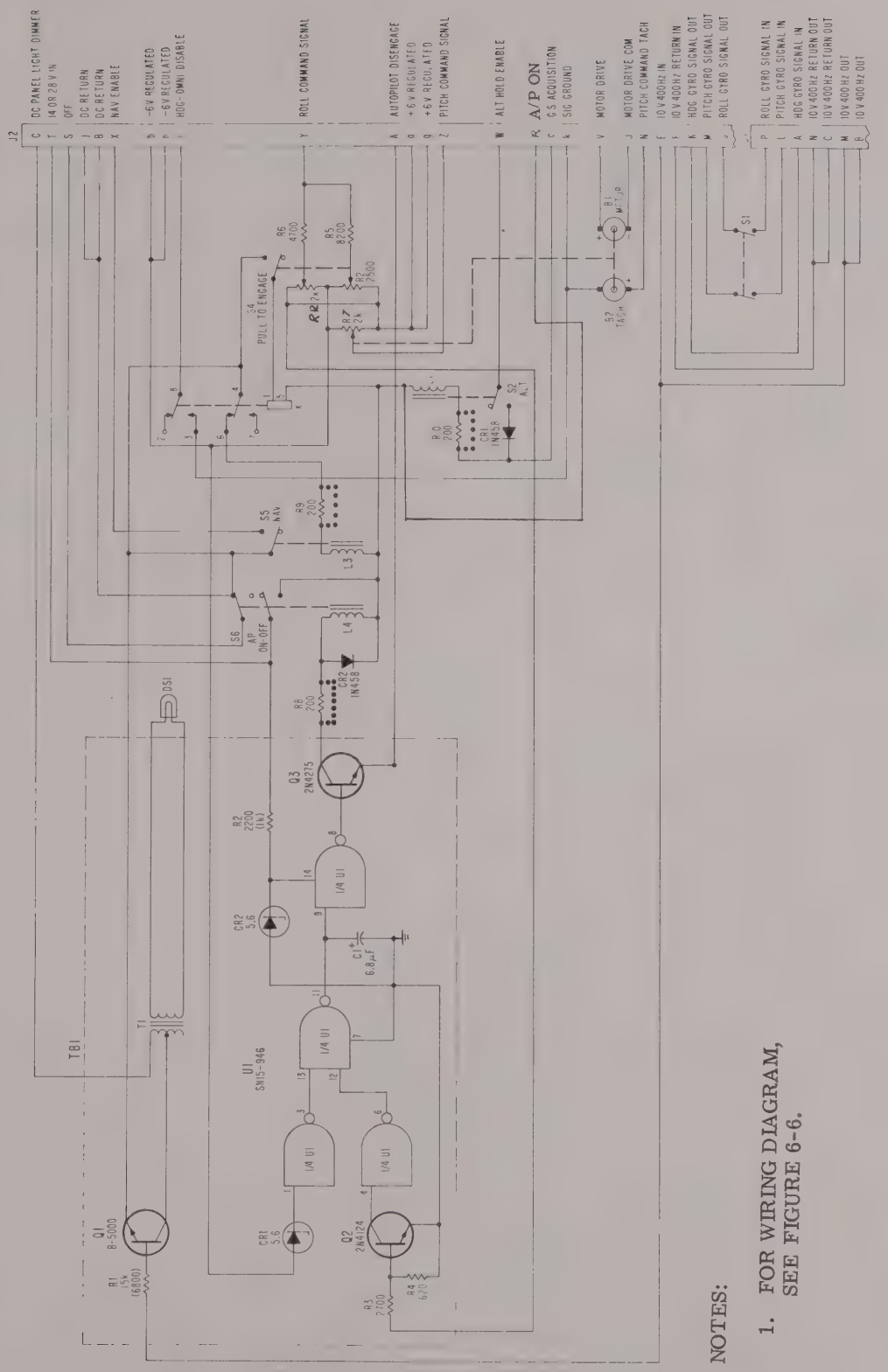


Figure 6-5. C530A Control Unit Schematic



NOTES:

1. FOR WIRING DIAGRAM, SEE FIGURE 6-6.

Figure 6-5A. C530A Control Unit Schematic

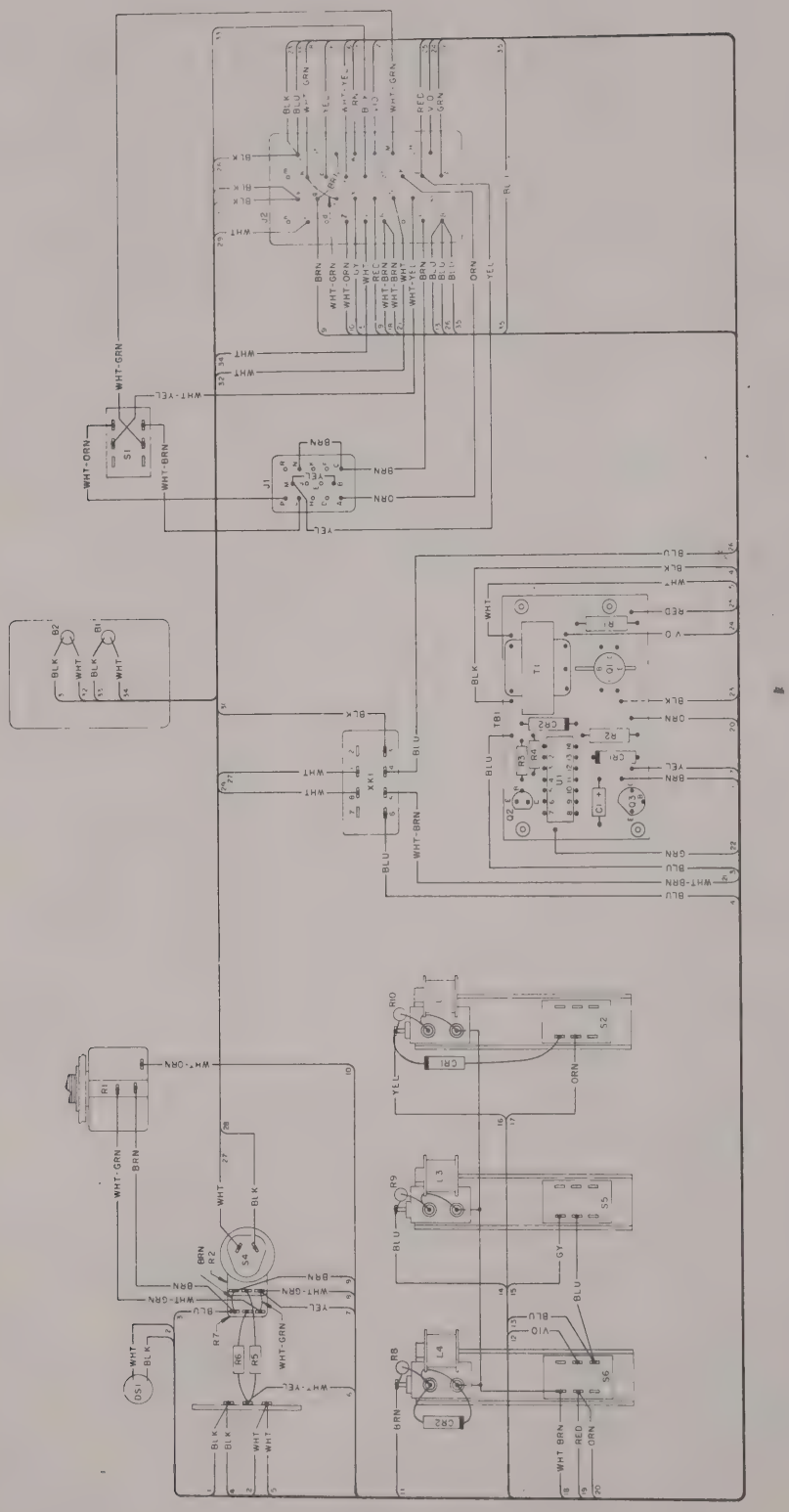
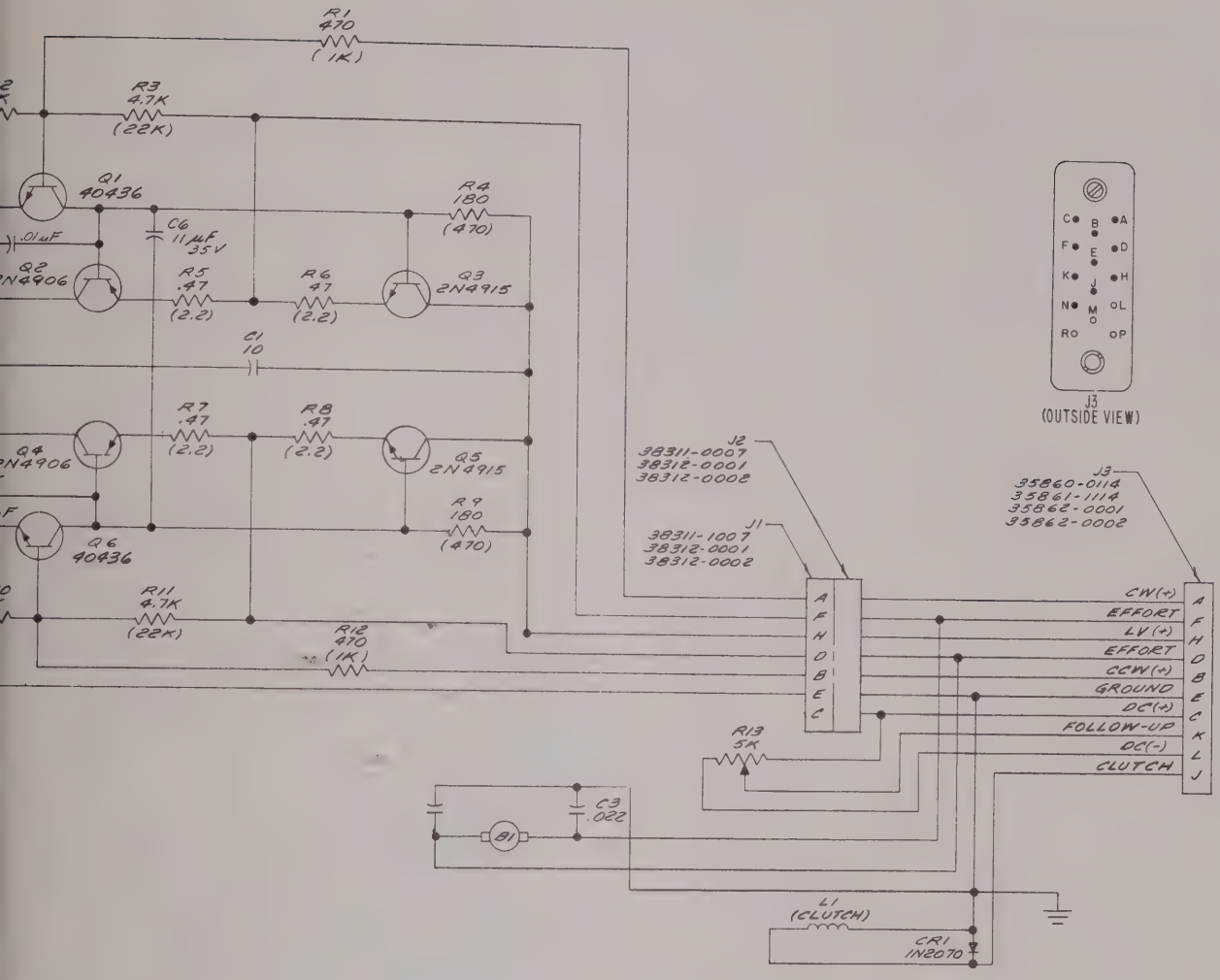


Figure 6-6. C530A Control Unit Wiring Diagram



NOTES:

1. FOR WIRING DIAGRAM, SEE FIGURE 6-8.
2. VALUES SHOWN IN PARENTHESES ARE PART OF 28-VOLT UNITS ONLY.
3. WIRES ARE NO. 24 AWG, STRANDED COPPER, TEFLON INSULATED.
4. TWO-CONDUCTOR SHIELDED CABLE IS PART OF B1 MOTOR ASSEMBLY.

Figure 6-7. PA500A Actuator Schematic

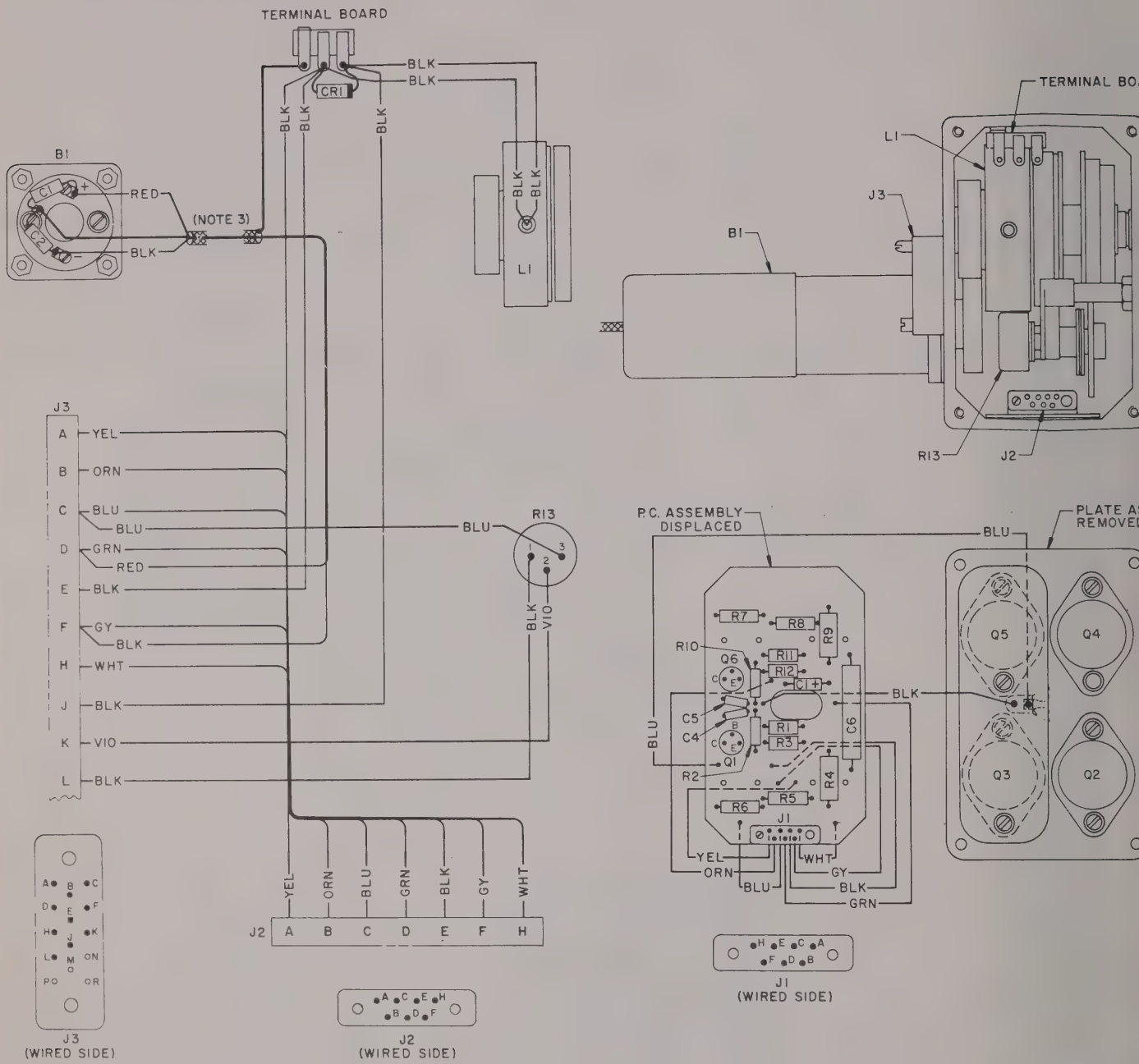
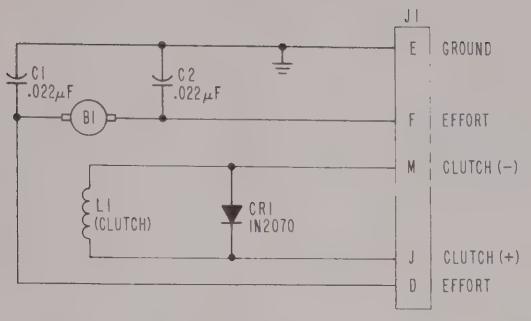
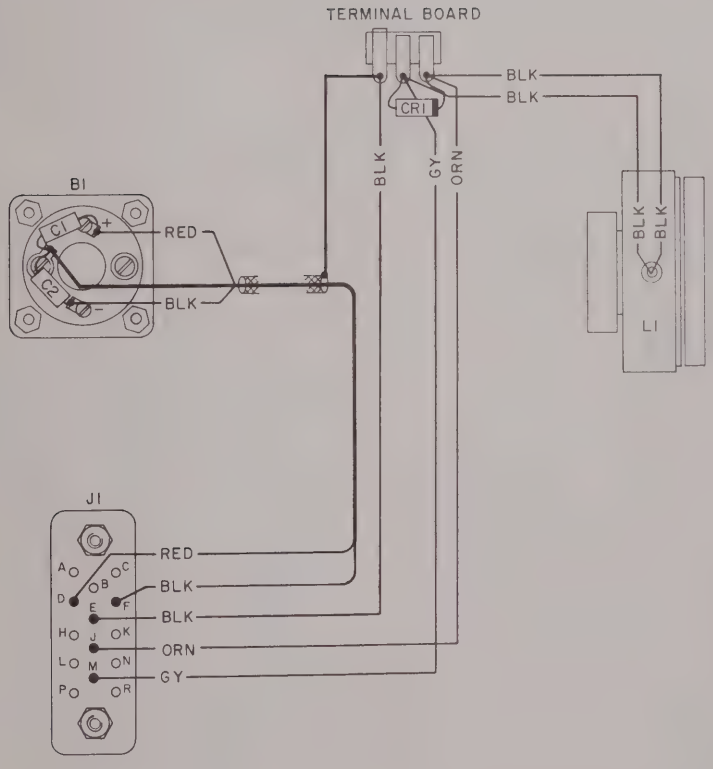


Figure 6-8. PA500A Actuator Wiring Diagram



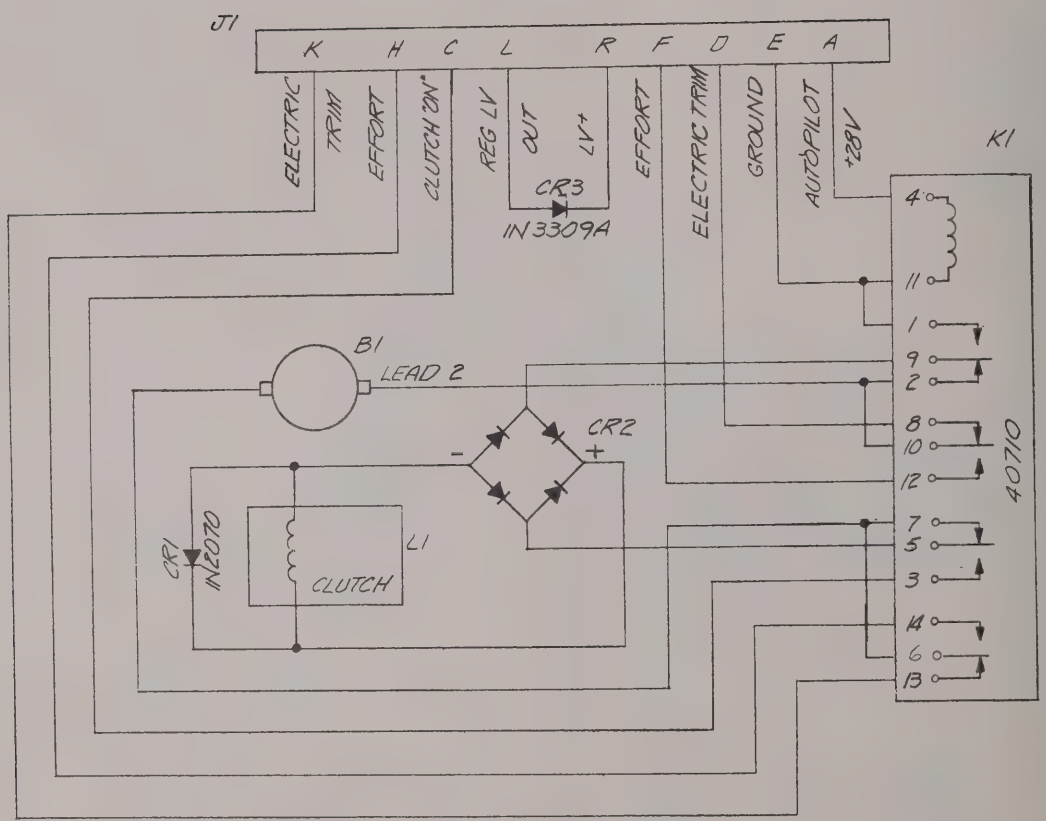
ES ARE NO. 24 AWG,
ANDED COPPER,
TLON INSULATED.
)-CONDUCTOR
ELDED CABLE IS
T OF B1 MOTOR
EMBLY.



P/N 38100-0128 Actuator

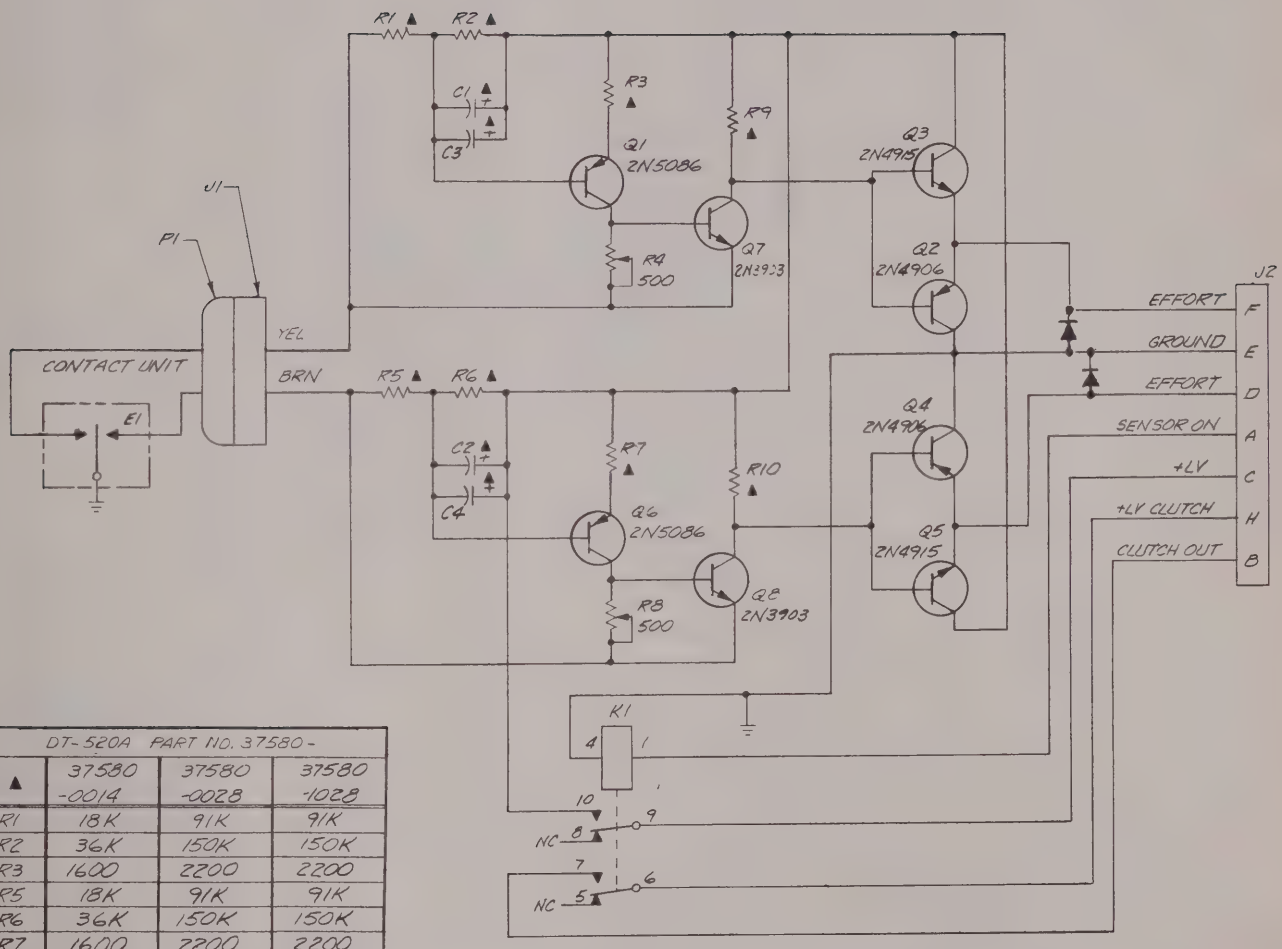
Figure 6-9. PA520A Actuator Schematic and Wiring

NOTE: ALL WIRES ARE SINGLE CONDUCTOR STRANDED COPPER, TEFLON INSULATED, NO. 24AWG.



USED WITH P/N 38480-1028

Figure 6-9A. PA520B P/N 40280-0028 Actuator Schematic and Wiring



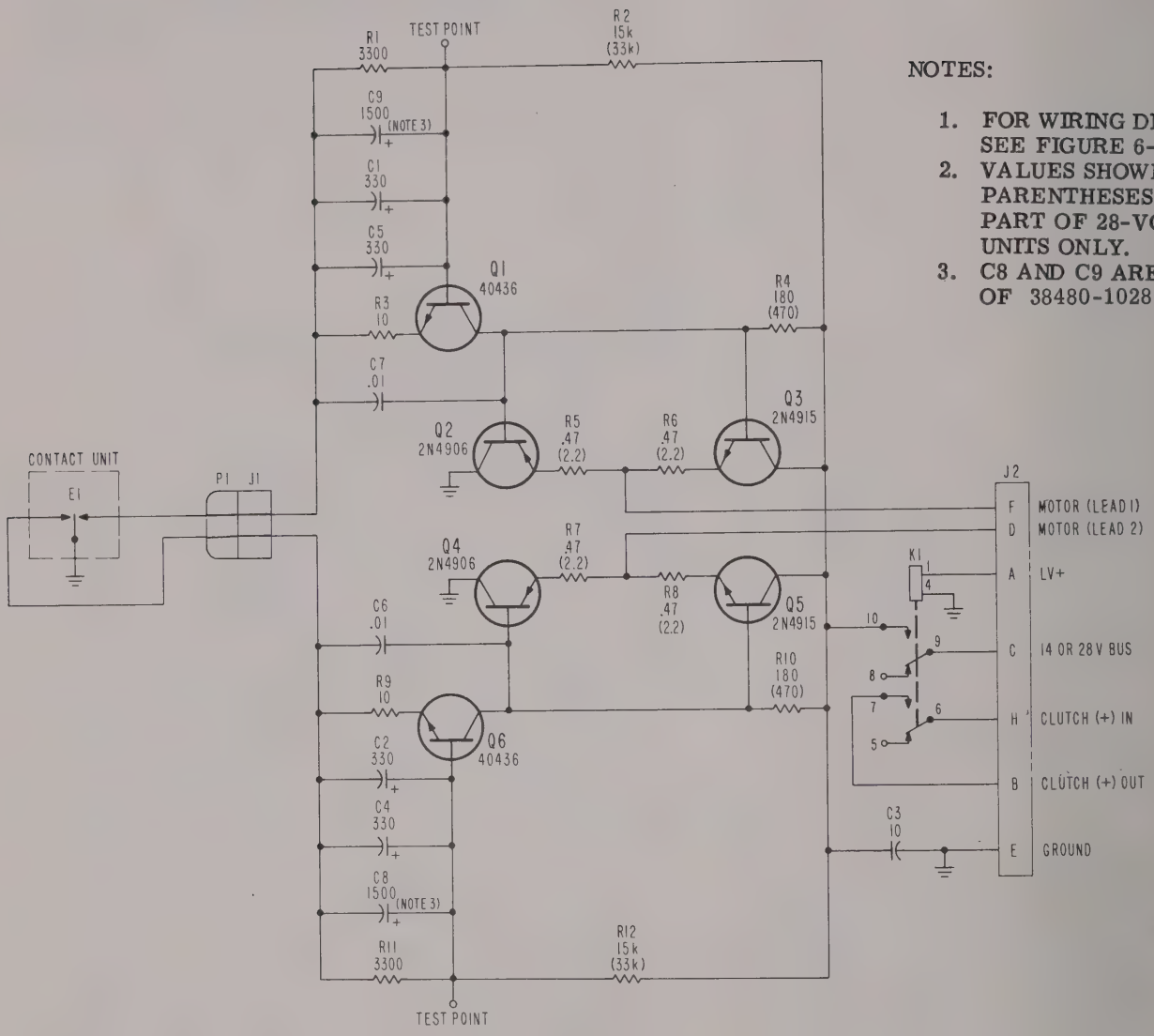
DT-520A PART NO. 37580-			
▲	37580 -0014	37580 -0028	37580 -1028
R1	18K	91K	91K
R2	36K	150K	150K
R3	1600	2200	2200
R5	18K	91K	91K
R6	36K	150K	150K
R7	1600	2200	2200
R9	200	1300	1300
R10	200	1300	1300
C1	150μF	22μF	100μF
C2	150μF	22μF	100μF
C3			47μF
C4			47μF

Note: CR1 and CR2 incorporated in Pitch Trim Sensors effective with the following serial numbers:

Part No.	Serial No.
37580-0014	325
37580-0028	975
37580-1028	850

USED WITH-P/N37580-0028 UNITS 535 AND ON
P/N37580-1028 UNITS 435 AND ON

Figure 6-9B. DT520A P/N 37580-1038 Pitch Trim Sensor Schematic

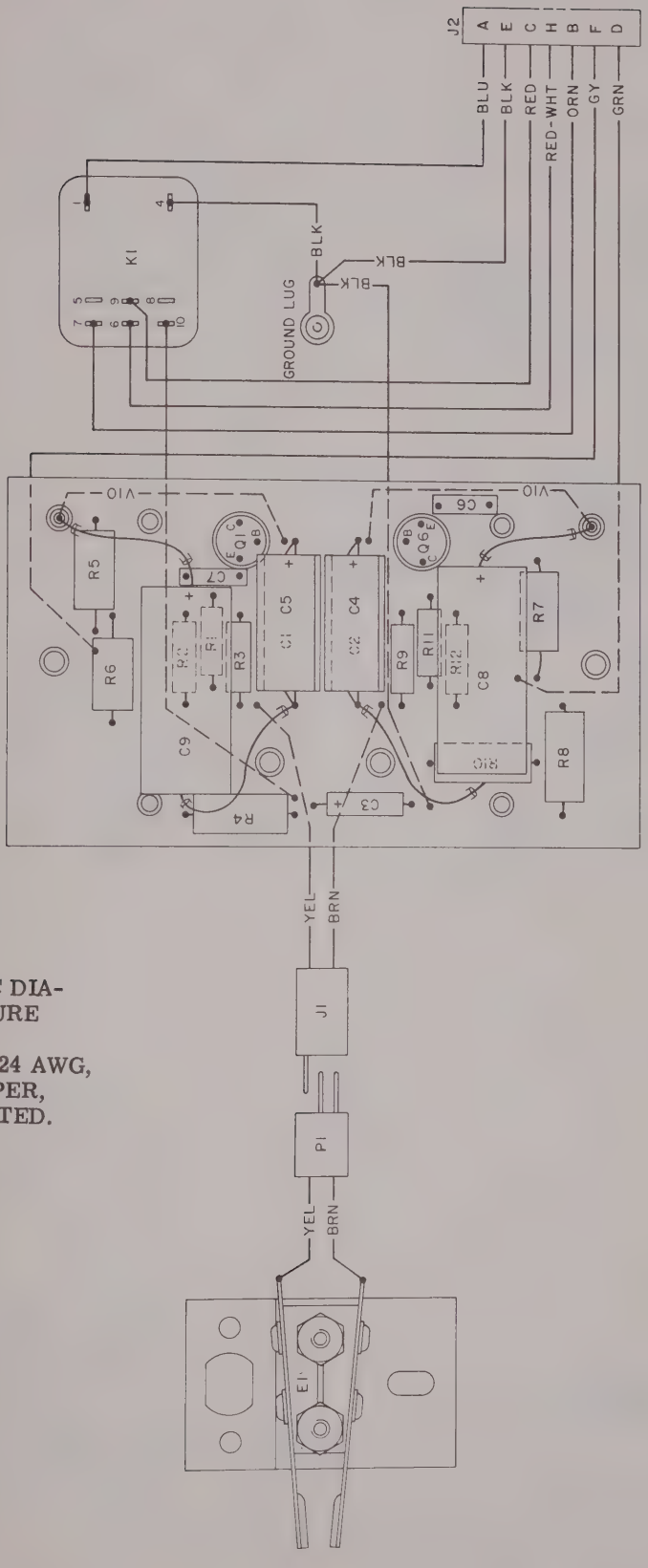


NOTES:

1. FOR WIRING DIAGRA SEE FIGURE 6-11.
2. VALUES SHOWN IN PARENTHESES ARE PART OF 28-VOLT UNITS ONLY.
3. C8 AND C9 ARE PAR OF 38480-1028

USED WITH -P/N37580-0028 ALL UNITS TO 535
P/N37580-1028 ALL UNITS TO 435

Figure 6-10. DT520A Pitch Trim Sensor Schematic



TES:

1. FOR SCHEMATIC DIAGRAM, SEE FIGURE 6-10.
2. WIRES ARE NO. 24 AWG, STRANDED COPPER, TEFLON INSULATED.

ALL EARLY PRODUCTION UNITS

Figure 6-11. DT520A Pitch Trim Sensor Wiring Diagram

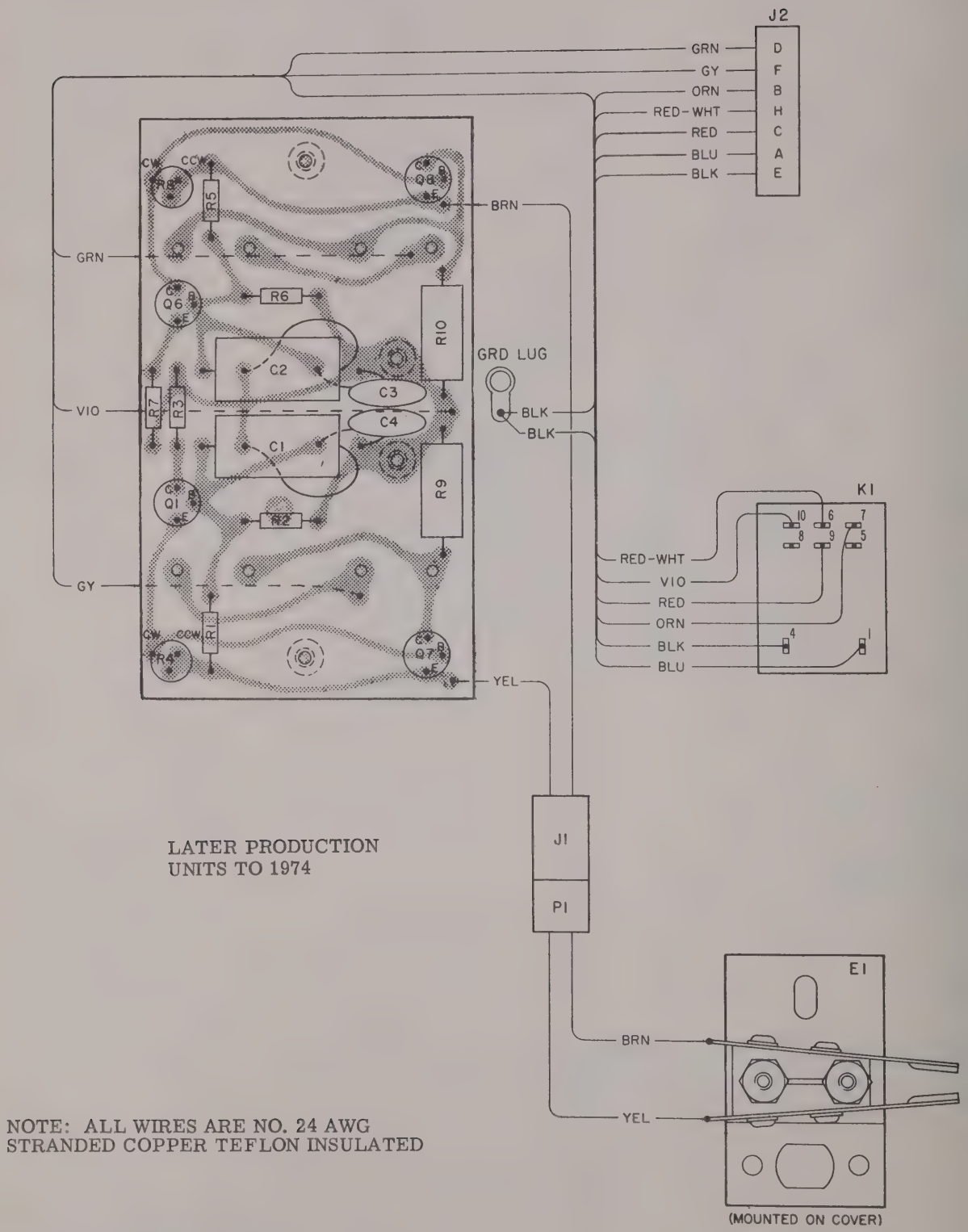
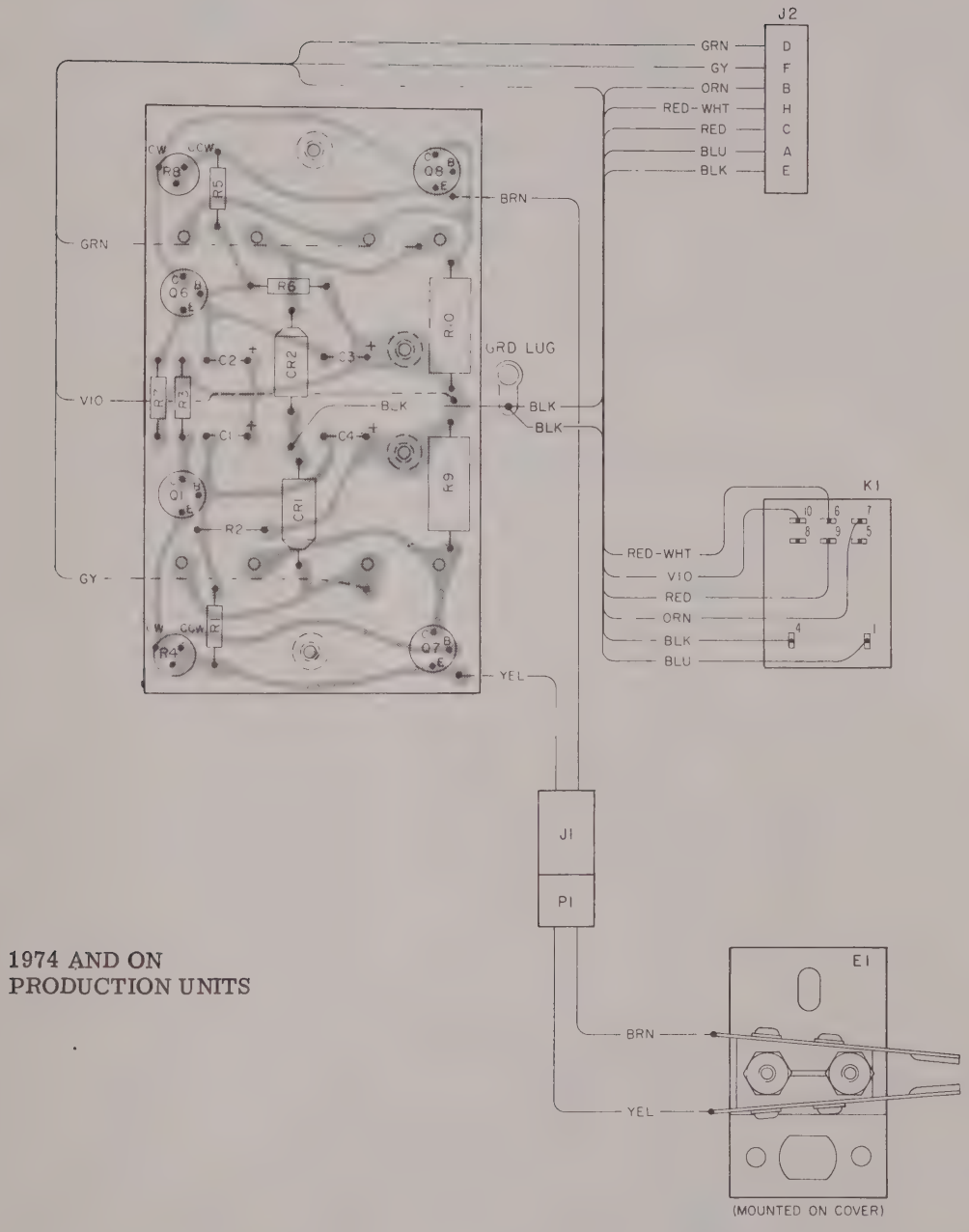
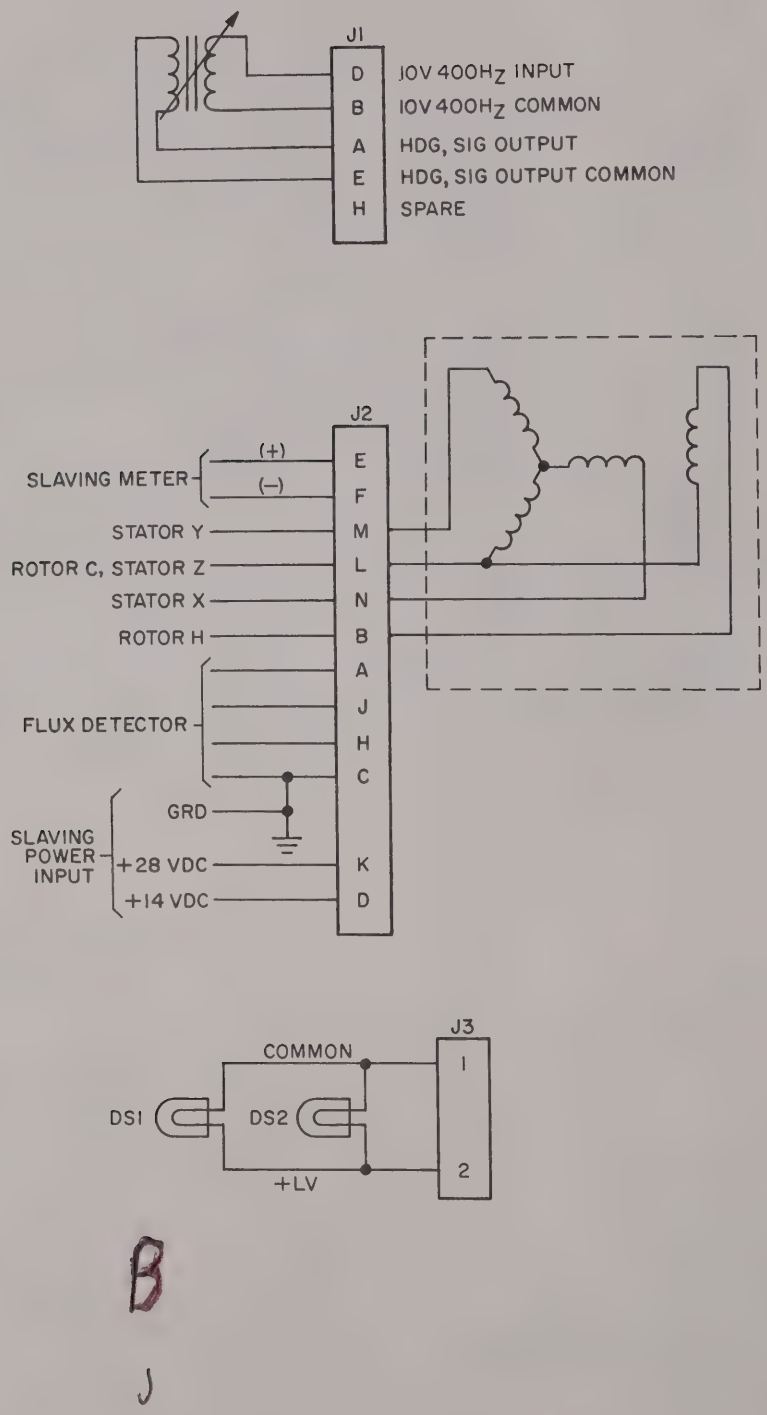


Figure 6-11A. DT520A Pitch Trim Sensor Wiring Diagram (Sheet 1 of 2)



NOTE: ALL WIRES ARE NO. 24 AWG
STRANDED COPPER TEFLON INSULATED

Figure 6-11A. DT520A Pitch Trim Sensor Wiring Diagram (Sheet 2)



B

J

Figure 6-11B. G502A/B/C Directional Gyro Schematic

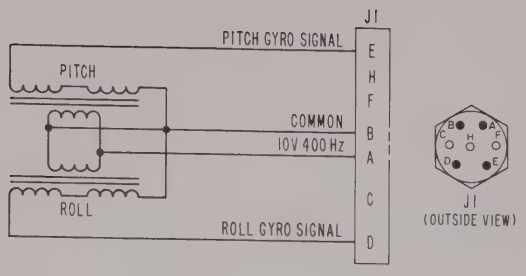


Figure 6-12. G519A-1 and G519B-1 Attitude Gyro Schematic

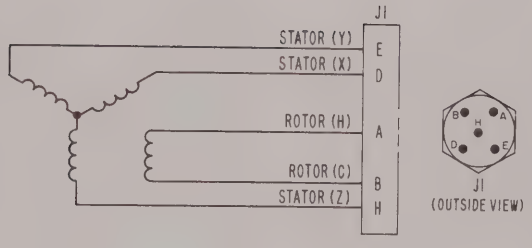
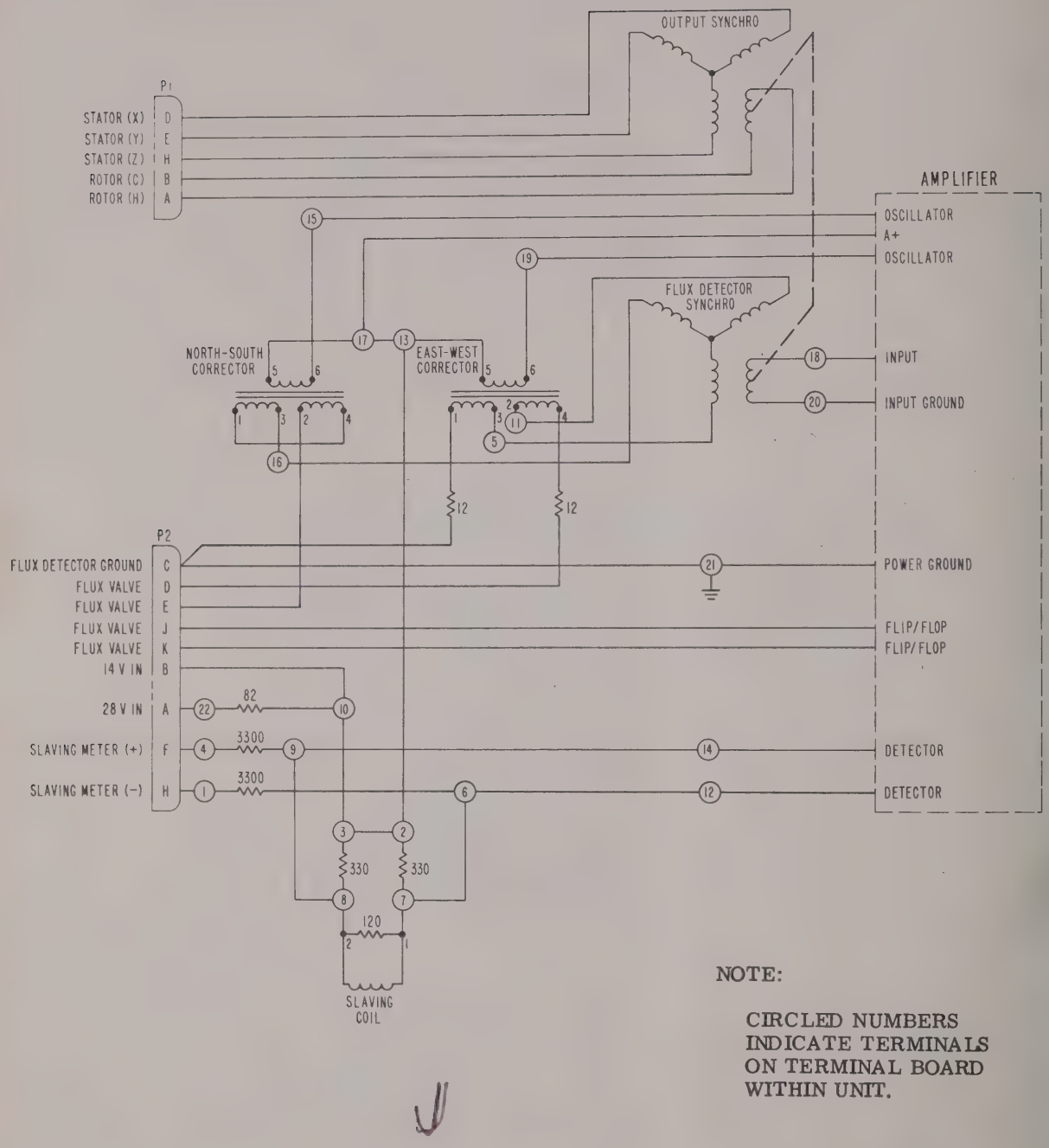


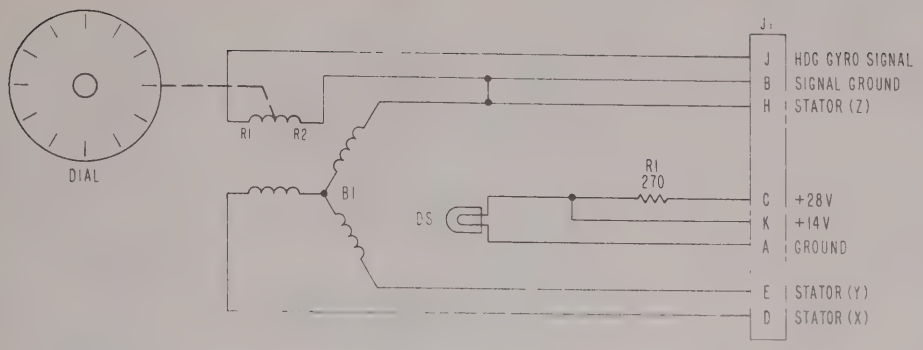
Figure 6-13. G520A Directional Gyro Schematic



NOTE:

CIRCLED NUMBERS INDICATE TERMINALS ON TERMINAL BOARD WITHIN UNIT.

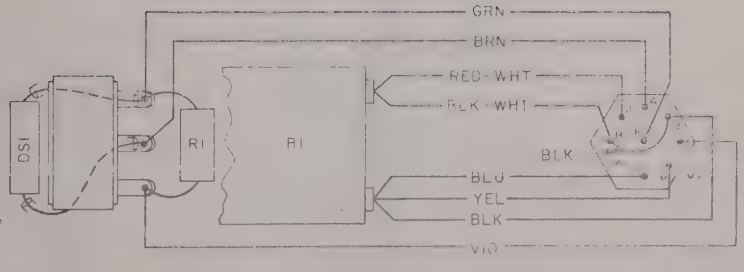
Figure 6-14. G520B Directional Gyro Schematic (Slaved)



NOTE:

FOR WIRING DIAGRAM,
SEE FIGURE 6-16.

Figure 6-15. S520A Heading Selector Schematic



NOTES:

1. FOR SCHEMATIC DIAGRAM, SEE FIGURE 6-15.
2. WIRES ARE NO. 26 AWG, STRANDED COPPER, TEFLON INSULATED.

Figure 6-16. S520A Heading Selector Wiring Diagram

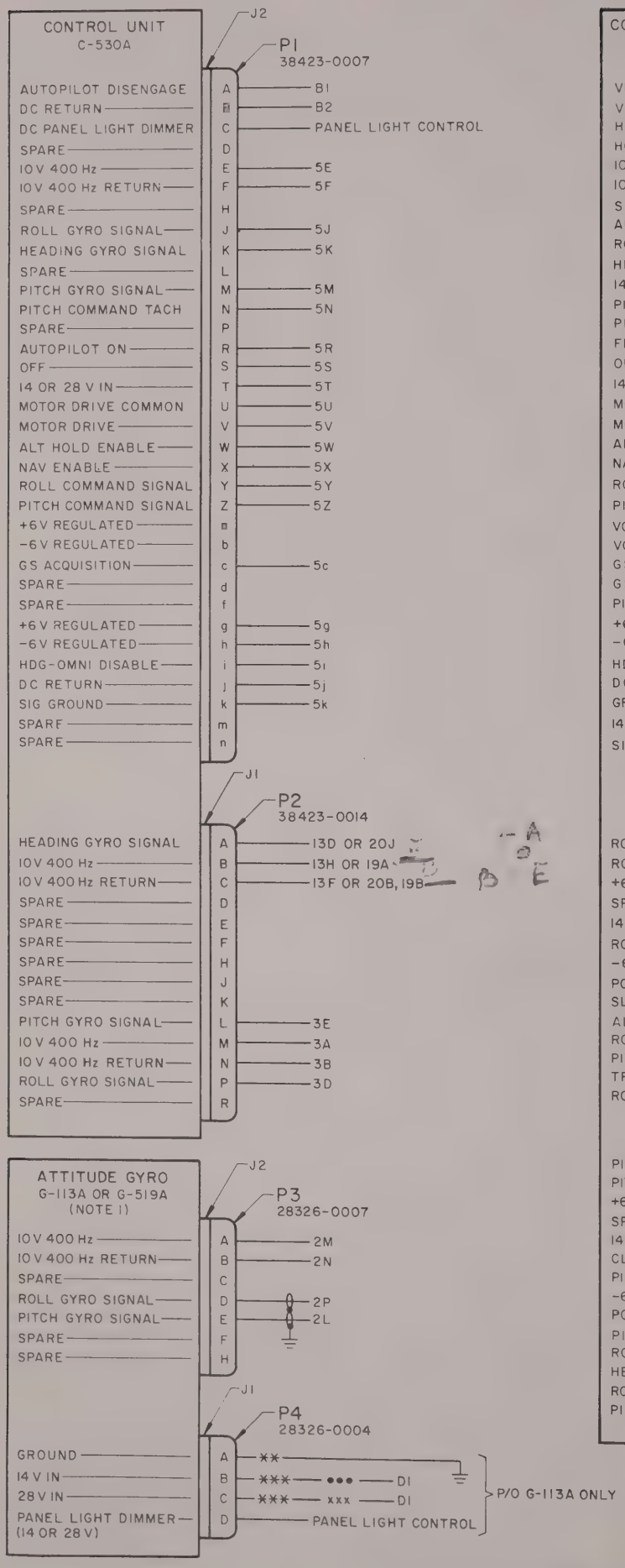


Figure 6-17. Cessna 400

8. CONNECTIONS AND VAL SHOWN ON ITEMS A AND ARE FOR 14-VOLT INST LATIONS. THOSE SHOW IN PARENTHESES ON THESE ITEMS ARE FOR 28-VOLT INSTALLATION
9. NO PIN IS INSTALLED I THIS POSITION. TO PR VENT ACCIDENTALLY INTERCHANGING ROLL AND PITCH ACTUATOR CONNECTIONS, ALL OTHER PINS MUST BE INSTALLED IN P6 AND
10. SHIELDED WIRES BETW P9 AND P12 MUST BE GROUNDED AT P12 ONL SHIELDED WIRES BE- TWEEN P11 AND P16 MUST BE GROUNDED AT P16 ONLY.
11. CONNECT TO FLAP POSITION POTENTIOM- ETER.
12. CONNECTIONS VARY WI AIRCRAFT MODEL. RE TO CHARTS:

Pitch Actuator P15	Models 310, 401, 402
A	P7 A
B	P7 B
C	P7 L
L	P7 C

Roll Actuator	Models 310, 401, 402
A	P6 A
B	P6 B
C	P6 L
L	P6 C

13. UNLESS OTHERWISE SPECIFIED, ALL CON- NECTIONS TO "AIR- CRAFT GROUND" MUST BE PHYSICALLY CONNECTED AT A COM MON TIE POINT IN THE VICINITY OF THE PITC ACTUATOR.
14. FOR SYSTEM TESTING, WIRES CONNECTED TO TEST POINTS SHOULD BE TERMINATED AT ANY CONVENIENT LOCATION.
15. THIS INTERCONNECT WIRING DIAGRAM IS TYPICAL ONLY. SEE THE APPLICABLE AIRCRAFT DRAWING FOR ACTUAL INTER- CONNECT INFORMA- TION.

SECTION VII

Parts List

7-1. GENERAL.

This section lists and describes replaceable parts for the 400A Nav-O-Matic components.

7-2. CA530A COMPUTER AMPLIFIER ASSEMBLY, C530A CONTROL UNIT ASSEMBLY, PA520B ACTUATOR ASSEMBLY, S520A HEADING SELECTOR ASSEMBLY, AND DT520A PITCH TRIM SENSOR ASSEMBLY

The parts for these components are listed in alphabetical-numerical sequence of the reference designation assigned to the parts on the schematic diagrams. The reference designations as shown are abbreviated; for the complete designation, prefix the designation shown with the assembly designation included at the beginning of each list. For example, the complete reference disignation for the Capacitor C1 in the Model Printed Wiring Assembly A1 would be A1C1. The location of a part by its reference designation may be determined by referring to the applicable assembly wiring diagram or parts location diagram in Section VI.

Within each assembly parts list, complete information is given for a part listed for the first time. Subsequent listings of the same part within the same assembly are referred back to the original listing. For example Capacitor C1 will have part number, description, and quantity, if C2 has the same part number as C1 the listing will read "Same as C1."

7-3. PA500A ACTUATOR ASSEMBLY.

The parts for the PA500A actuator are listed in recommended order of dissassembly with an illustrated parts breakdown, except for attaching parts which are listed directly after the part attached. Index numbers are assigned in sequence to each part and are keyed to the exploded view, Figure 7-1. Where only certain parts of an assembly are procurable, these are preceded by the caption "Partial Breakdown Follows." For cross reference, a part number numerical index and a reference designation index are included following the parts list.

7-4. MANUFACTURERS' CODES AND PART NUMBER.

Part Numbers are listed in a separate column in the parts list. Other manufacturer's part numbers are identified by the manufacturer's numerical code (based on the Federal Supply Code for Manufacturers) and the manufacturer's part number. This information is listed either in a separate column or enclosed within parentheses at the end of the part description. The numerical codes are used in the parts lists, the names and addresses of the manufacturers are as follows:

Code	Name and Address
01121	Allen Bradley Co. 1201 South 2nd Street Milwaukee, Wisconsin 53204
01295	Texas Instruments Inc. Semiconductor Components Division 13500 North Central Expressway Dallas, Texas 75231
02660	Amphenol Corp. 2801 South 25th Ave. Broadview, Illinois 60153
03508	General Electric Co. Semiconductor Products Dept. Electronics Park Syracuse, New York 13201
03911	Clairex Corp. 1239 Broadway New York, New York 10001
04713	Motorola Semiconductor Products, Inc. 5005 East McDowell Road Phoenix, Arizona 85008
06288	Edal Industries, Inc. 4 Short Beach Road East Haven, Connecticut 06512
11700	J. B. Electronics Transformers, Inc. 2310 West Armitage Chicago, Illinois 60647
13209	Bendix Corp. Semiconductor Division South Street Holmoel, New Jersey 07733
13327	Solitron Devices, Inc. 256 Oak Tree Road Tappen, New York 10983

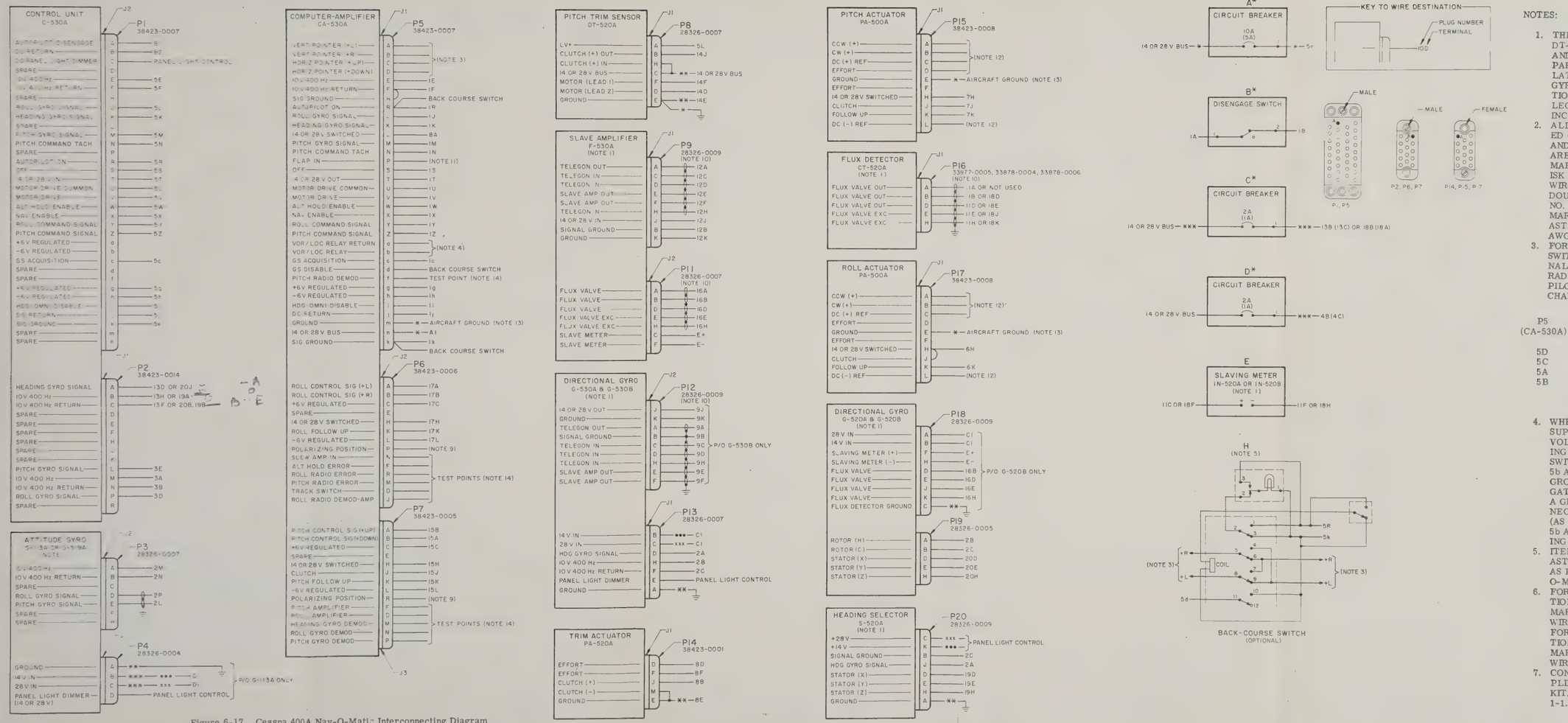


Figure 6-17. Cessna 400A Nav-O-Matic Interconnecting Diagram

NOTES:

1. THE C-530A, CA-530A, DT-520A, PA-520A, S520A AND BOTH PA-500A ARE PART OF EVERY INSTALLATION. ONE ATTITUDE GYRO AND ONE DIRECTIONAL GYRO, AS SELECTED, ARE ALWAYS INCLUDED.
2. ALL WIRES ARE STRANDED COPPER. UNMARKED AND SHIELDED WIRES ARE NO. 22 AWG. WIRES MARKED WITH AN ASTERISK ARE NO. 16 AWG. WIRES MARKED WITH DOUBLE ASTERISK ARE NO. 18 AWG. WIRES MARKED WITH A TRIPLE ASTERISK ARE NO. 20 AWG.
3. FOR BACK-COURSE SWITCH, CONNECT SIGNALS FROM NAVIGATION RADIO SETS TO AUTOPILOT AS SHOWN IN CHART.

P5 (CA-530A)	Back-Course Switch	B-41A	IN-41	IN-543
5D			12	15
5C			13	14
5A	4 & 9		2	8
5B	6 & 7		1	7
	8(+L)	u		11
	5(+R)	v		6

4. WHEN NAVIGATION SET SUPPLIES A 14- OR 28-VOLT VOR/LOC SWITCHING SIGNAL, CONNECT SWITCHING SIGNAL TO 5b AND CONNECT 5a TO GROUND. WHEN NAVIGATION SET SUPPLIES A GROUND SIGNAL, CONNECT 14 OR 28 VOLTS (AS APPLICABLE) TO 5b AND CONNECT SWITCHING SIGNAL TO 5a.
5. ITEMS MARKED WITH AN ASTERISK ARE SUPPLIED AS PART OF 400A NAV-O-MATIC.
6. FOR 14-VOLT INSTALLATION, CONNECT WIRES MARKED ooo AND OMIT WIRES MARKED xxx. FOR 28-VOLT INSTALLATION, CONNECT WIRES MARKED xxx AND OMIT WIRES MARKED ooo.
7. CONNECTORS ARE SUPPLIED IN CONNECTOR KIT. REFER TO TABLE 1-1.
8. CONNECTIONS AND VALUES SHOWN ON ITEMS A AND C ARE FOR 14-VOLT INSTALLATIONS. THOSE SHOWN IN PARENTHESES ON THESE ITEMS ARE FOR 28-VOLT INSTALLATIONS.
9. NO PIN IS INSTALLED IN THIS POSITION. TO PREVENT ACCIDENTALLY INTERCHANGING ROLL AND PITCH ACTUATOR CONNECTIONS, ALL OTHER PINS MUST BE INSTALLED IN P6 AND P7.
10. SHIELDED WIRES BETWEEN P8 AND P12 MUST BE GROUNDED AT P12 ONLY. SHIELDED WIRES BETWEEN P11 AND P16 MUST BE GROUNDED AT P16 ONLY.
11. CONNECT TO FLAP POSITION POTENTIOMETER.
12. CONNECTIONS VARY WITH AIRCRAFT MODEL. REFER TO CHARTS:

Pitch Actuator P15	Models 310, 401, 402
A	P7 A
B	P7 B
C	P7 L
L	P7 C

Roll Actuator	Models 310, 401, 402
A	P6 A
B	P6 B
C	P6 L
L	P6 C

13. UNLESS OTHERWISE SPECIFIED, ALL CONNECTIONS TO "AIRCRAFT GROUND" MUST BE PHYSICALLY CONNECTED AT A COMMON TIE POINT IN THE VICINITY OF THE PITCH ACTUATOR.
14. FOR SYSTEM TESTING, WIRES CONNECTED TO TEST POINTS SHOULD BE TERMINATED AT ANY CONVENIENT LOCATION.
15. THIS INTERCONNECT WIRING DIAGRAM IS TYPICAL ONLY. SEE THE APPLICABLE AIRCRAFT DRAWING FOR ACTUAL INTERCONNECT INFORMATION.

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7-3. PA500A ACTUATOR ASSEMBLY.

The parts for the PA500A actuator are listed in recommended order of dissassembly with an illustrated parts breakdown, except for attaching parts which are listed directly after the part attached. Index numbers are assigned in sequence to each part and are keyed to the exploded view, Figure 7-1. Where only certain parts of an assembly are procurable, these are preceded by the caption "Partial Breakdown Follows." For cross reference, a part number numerical index and a reference designation index are included following the parts list.

7-4. MANUFACTURERS' CODES AND PART NUMBER.

Part Numbers are listed in a separate column in the parts list. Other manufacturer's part numbers are identified by the manufacturer's numerical code (based on the Federal Supply Code for Manufacturers) and the manufacturer's part number. This information is listed either in a separate column or enclosed within parentheses at the end of the part description. The numerical codes are used in the parts lists, the names and addresses of the manufacturers are as follows:

Code	Name and Address
01121	Allen Bradley Co. 1201 South 2nd Street Milwaukee, Wisconsin 53204
01295	Texas Instruments Inc. Semiconductor Components Division 13500 North Central Expressway Dallas, Texas 75231
02660	Amphenol Corp. 2801 South 25th Ave. Broadview, Illinois 60153
03508	General Electric Co. Semiconductor Products Dept. Electronics Park Syracuse, New York 13201
03911	Clairex Corp. 1239 Broadway New York, New York 10001
04713	Motorola Semiconductor Products, Inc. 5005 East McDowell Road Phoenix, Arizona 85008
06288	Edal Industries, Inc. 4 Short Beach Road East Haven, Connecticut 06512
11700	J. B. Electronics Transformers, Inc. 2310 West Armitage Chicago, Illinois 60647
13209	Bendix Corp. Semiconductor Division South Street Holmoel, New Jersey 07733
13327	Solitron Devices, Inc. 256 Oak Tree Road Tappen, New York 10983

Code	Name and Address
14412	American Precision Industries, Inc. 10 Layfayette Square Buffalo, New York 14203
14655	Cornell Dubilier Electric Corp. 50 Paris Street Newark, New Jersey 07105
14752	Electro Cube, Inc. 1710 South Delmar Ave. San Gabriel, California 91776
17803	Fairchild Camera and Instrument Corp. Semiconductor Division 423 National Drive Mountainview, California 94041
21335	Fafnir Bearing Co. 37 Booth Street New Britain, Connecticut 06052
25140	Globe Industries, Inc. 2275 Stanley Ave. Dayton, Ohio 45404
26769	National Capacitors, Inc. P. O. Box 8205 West Palm Beach, Florida 33407
44655	Ohmite Mfg. Co. 3601 West Howard Street Skokie, Illinois 60076
45722	Parker Kalon Division of General American Transportation Enten Road Clifton, New Jersey 07011
49956	Ratheon Co. Components Division Semoconductor Operation 350 Ellis Street Mountainview, California 94042
56289	Sprague Electric Co. 367 Marshall Street North Adams, Massachusetts 01247
71450	Cts Corp. 1142 West Beardsley Ave. Elkhart, Indiana 46514
71744	Chicago Miniature Lamp Works 4433 Ravenswood Ave. Chicago, Illinois 60640
72962	Elastic Stop Nut Corp of America 2330 Vauxhall Road Union, New Jersey 07083
72982	Erie Technological Products, Inc. 644 West 12th Street Erie, Pennsylvania 16512

Code	Name and Address
73138	Beckman Instruments, Inc. Heliipot Division 2500 Harbor Boulevard Fullerton, California 92634
73445	Amperex Electronic Corp. 230 Duffy Ave. Hicksvill, Long Island, New York 11801
73957	Groove Pin Corp. 1125 Hendricks Casuseway Ridgefield, New Jersey 07657
75042	Irc, Inc. 401 North Broad Street Philadelphia, Pennsylvania 19108
76095	Magnetic Windings Co. Free Mansburg Road Easton, Pennsylvania 18042
76381	Minnesota Mining and Mfg. Co. 2501 Hudson Road St. Paul, Minnesota 55119
78189	Shakeproof Div of Illinois Tool Works, Inc. 1955 St. Charles Road Elgin, Illinois 60120
79089	RCA 415 South 5th Street Harrison, New Jersey 07029
79136	Waldes Kohinoor, Inc. 47-16 Austel Place Long Island City, New York 11101
79729	Continental Wirt Electronics Corp. Philadelphia, Pennsylvania
79963	Zieric Mfg. Corp. 83 Rockdale Avenue New Rochelle, New York 10802
80294	Bourns, Inc. 1200 Columbia Avenue Riverside, California 92507
81071	Schauer Manufacturing Corp. 4500 Alpine Cincinnati, Ohio 45242
81073	Grayhill, Inc. 561 Hillgrove Ave. La Grange, Illinois 60076
81312	Winchester Electronics Division of Litton Industries, Inc. Main Street and Hillside Avenue Oakville, Connecticut 45242
81483	International Rectifier Corp. 233 Kansas Street El Segundo, California 90245

Code	Name and Address
82768	Phillips Advance Control Co. 59 West Washington Street Joliet, Illinois 60431
90634	Gulton Industries, Inc. 212 Durham Avenue Metuchen, New Jersey 08840
91265	Goshen Rubber Co. 1525 South 10th Street Goshen, Indiana 46526
91637	Dale Electronics, Inc. P. O. Box 609 Columbus, Ohio 68601
91929	Honeywell, Inc. Microswitch Division Chicago and Spring Street Freeport, Illinois 61032
93332	Sylvania Electric Products, Inc. Semiconductor Product Division 100 Sulyan Road Woburn, Massachusetts 01801
EM	Electra Midland Corp. San Diego, California
MURA	Mura Corp. 777 Northern Boulevard Great Neck, New York
PITT	Pittman Corp. Sellersville, Pennsylvania 18960
98291	Selectro Corp. 225 Hoyt Street Mamaroneck, New York 10544

: MODEL PRINTED ASSEMBLY, A1

Reference Des.	Description	Part No.	Manufacturer & Part No.
	Note The CA-530A model part numbers and the related ("used on") A1 part numbers are as follows: CA-530A: 37970-0028, -0128; -0228; -0328; -1028; -1128; -1228; -1328; -4028; -5028; -6028; -7028 A1: 38913-0028; -0028; -0028; -0028; -1028; -1028; -1028; -1028; -4028; -4028; -4028		
C1	CAPACITOR, Fixed, tantalum, 1.1 Mfd ± 10%, 6 Vdc, non-polarized	39175-8111	26769 type NS
C2	CAPACITOR, Fixed, tantalum, 11 Mfd ± 10%, 6 Vdc, non-polarized (used on 38913-1028)	39175-1110	26769 type NS
C2	CAPACITOR, Fixed, tantalum, 1.1 Mfd ± 10%, 6 Vdc, non-polarized (used on 38913-0028, -4028)	39175-1230	26769 type NS
C3	CAPACITOR, Fixed, tantalum, 160 Mfd ± 10%, 6 Vdc, non-polarized	39175-1161	26769 type NS
C4-C6	Same as C3		
C7	Same as C1		
C8	CAPACITOR, Fixed, tantalum, 41 Mfd ± 10%, 6 Vdc, non-polarized (used on 38913-0028, -4028)	39175-1410	26769 type NS
C9	CAPACITOR, Fixed, tantalum, 16 Mfd ± 10% 35 Vdc, non-polarized	39175-0160	26769 type NS
CR1	SEMICONDUCTOR DEVICE, Diode	34410	93332 1N270
CR2-CR4	Same as CR1		
R1	RESISTOR, Fixed, comp, 51,000 ohms ± 5%, 1/4 W (used on 38913-1028)	341-0513	01121 CB5135
R1	RESISTOR, Fixed, comp, 1000,000 ohms ± 5%, 1/4 W (used on 38913-0038, -4028)	341-0104	01121 CB1045
R2	RESISTOR, Fixed, comp, 3300 ohms ± 5%, 1/4 W	341-1332	01121 CB3325
R3	Same as R2		
R4	RESISTOR, Fixed, comp, 27,000 ohms ± 5%, 1/4 W (used on 38913-1028)	341-0273	01121 CB2735
R4	RESISTOR, Fixed, comp, 15,000 ohms ± 5%, 1/4 W (used on 38913-0028, -4028)	341-0153	01121 CB1535
R5	RESISTOR, Fixed, comp, 2200 ohms ± 5%, 1/4 W	341-0222	01121 CB0222
R6	RESISTOR, Variable, metalized ceramic, 2000 ohms ± 10%, 1/2 W	38283-0202	80031 ET34P202-003
R7	Same as R5		
R8	RESISTOR, Fixed, comp, 15,000 ohms ± 5%, 1/4 W (used on 38913-0028, -4028)	341-0153	01121 CB 1535
R8	RESISTOR, Fixed, comp, 27,000 ohms ± 5%, 1/4 W (used on 38913-1028)	341-0273	01121 CB2735
R9	Same as R6		
R10	RESISTOR, Fixed, comp, 1000 ohms ± 5%, 1/4 W	341-0102	01121 CB1025

Reference Des.	Description	Part No.	Manufacturer & Part No.
R11	RESISTOR, Fixed, comp, 24, 000 ohms ± 5%, 1/4 W (used on 38913-1028)	341-0243	01121 CB2435
R11	RESISTOR, Fixed, comp, 18, 000 ohms ± 5%, 1/4 W (used on 38913-0028, -4028)	341-0183	01121 CB1835
R12	RESISTOR, Fixed, comp, 470 ohms ± 5%, 1/4 W	341-0471	01121 CB4715
R13	RESISTOR, Fixed, comp, 56, 000 ohms ± 5%, 1/4 W (used on 38913-1028)	341-0563	01121 CB5635
R13	RESISTOR, Fixed, comp, 30, 000 ohms ± 5%, 1/4 W (used on 38913-0028, -4028)	341-0303	01121 CB3035
R14	RESISTOR, Fixed, comp, 120, 000 ohms ± 5%, 1/4 W (used on 38913-1028)	341-0124	01121 CB1245
R14	RESISTOR, Fixed, comp, 82, 000 ohms ± 5%, 1/4 W (used on 38913-0028, -4028)	341-0323	01121 CB8235
R15	RESISTOR, Fixed, comp, 300, 000 ohms ± 5%, 1/4 W	341-0304	01121 CB3045
R16	RESISTOR, Fixed, comp, 47, 000 ohms ± 5%, 1/4 W	341-0473	01121 CB4735
R17	RESISTOR, Fixed, comp, 10, 000 ohms ± 5%, 1/4 W	341-0103	01121 CB1035
R18	Same as R17		
R19	RESISTOR, Fixed, comp, 33, 000 ohms ± 5%, 1/4 W	341-0333	01121 CB3335
R20	RESISTOR, Fixed, comp, 3000 ohms ± 5%, 1/4 W	341-0302	01121 CB3025
R21	RESISTOR, Fixed, comp, 18, 000 ohms ± 5%, 1/4 W	341-0183	01121 CB1835
R22	RESISTOR, Fixed, comp, 39, 000 ohms ± 5%, 1/4 W	341-0393	01121 CB3935
R23	Same as R16		
R24	RESISTOR, Fixed, comp, 47, 000 ohms ± 5%, 1/4 W (used on 38913-1028)	341-0473	01121 CB4735
R24	RESISTOR, Fixed, comp, 75, 000 ohms ± 5%, 1/4 W (used on 38913-0028, -4028)	341-0753	01121 CB7535
R25	RESISTOR, Fixed, comp, 20, 000 ohms ± 5%, 1/4 W (used on 38913-1028)	341-0203	01121 CB2035
R25	RESISTOR, Fixed, comp, 30, 000 ohms ± 5%, 1/4 W (used on 38913-4028)	341-0303	01121 CB3035
R26	RESISTOR, Fixed, comp, 18, 000 ohms ± 5%, 1/4 W (used on 38913-1028)	341-0183	01121 CB1835
R26	RESISTOR, Fixed, comp, 22, 000 ohms ± 5%, 1/4 W (used on 38913-0028, -4028)	341-0223	01121 CB2235
R27	Same as R10		
R28	Same as R6		
R29	Same as R10		
R30	Same as R10		
R31	Same as R6		
R32	Same as R10		
R33	RESISTOR, Fixed, comp, 62, 000 ohms ± 5%, 1/4 W (used on 38913-1028)	341-0623	01121 CB6235
R33	RESISTOR, Fixed, comp, 30, 000 ohms ± 5%, 1/4 W (used on 38913-0028, -4028)	341-0303	01121 CB3035
R34	Same as R6		
R35	RESISTOR, Fixed, comp, 2000 ohms ± 5%, 1/4 W	341-0202	01121 CB2025

Reference Des.	Description	Part No.	Manufacturer & Part No.
R36	RESISTOR, Fixed, comp, 3000 ohms ± 5%, 1/4 W (used on 38913-0028)	341-0302	01121 CB3025
R36	RESISTOR, Fixed, comp, 3300 ohms ± 5%, 1/4 W (used on 38913-1028)	341-0332	01121 CB3325
R36	RESISTOR, Fixed, comp, 3900 ohms ± 5%, 1/4 W (used on 38913-4028)	341-0392	01121 CB3925
R37	Same as R6		
R38	Same as R10		
R39	RESISTOR, Fixed, comp, 15, 000 ohms ± 5%, 1/4 W (used on 38913-1028)	341-0153	01121 CB1535
R39	RESISTOR, Fixed, comp, 30, 000 ohms ± 5%, 1/4 W (used on 38913-0028)	341-0303	01121 CB3035
R39	RESISTOR, Fixed, comp, 20, 000 ohms ± 5%, 1/4 W (used on 38913-4028)	341-0203	01121 CB2035
R40	RESISTOR, Fixed, comp, 150, 000 ohms ± 5%, 1/4 W	341-0154	01121 CB1545
R41	RESISTOR, Fixed, comp, 680, 000 ohms ± 5%, 1/4 W	341-0684	01121 CB6845
R42	RESISTOR, Fixed, comp, 39, 000 ohms ± 5%, 1/4 W (used on 38913-1028)	341-0393	01121 CB3935
R42	RESISTOR, Fixed, comp, 15, 000 ohms ± 5%, 1/4 W (used on 38913-0028, -4028)	341-0153	01121 CB1535
R43	RESISTOR, Fixed, comp, 110, 000 ohms ± 5%, 1/4 W	341-0114	01121 CB1145
R44	RESISTOR, Fixed, comp, 300 ohms ± 5%, 1/4W (used on 38913-0028, -4028)	341-0301	01121 CB3015
R45	RESISTOR, Fixed, comp, 10, 000 ohms ± 5%, 1/4 W	341-0103	01121 CB1035
R46	RESISTOR, Fixed, comp, 3000 ohms ± 5%, 1/4 W	341-0302	01121 CB3025
VR1	SEMICONDUCTOR DEVICE, Diode, Zener	40429-4515	04713 MZ4615
VR2-VR4	Same as VR1		
VR5	SEMICONDUCTOR DEVICE, Diode	35829-9821	81483 1N756

RELAY BRACKET ASSEMBLY, A2 (Part No. 38919 and 42641)

Reference Des.	Description	Part No.	Manufacturer
	Note The CA-530A model part numbers and the related ("used on") A2 part numbers are as follows: CA-530A — A2 37970-0028, -0128, -1028, -1128, -4028, -5028 — 38919 37970-0228, -0328, -1228, -1328, -6028, -7028 — 42641		
C1	CAPACITOR, Fixed, tantalum, 33 Mfd ± 20%, 35 Vdc	21485-0330	
CR1	SEMICONDUCTOR DEVICE, Diode	32689-0005	01295 1N458
CR2	SEMICONDUCTOR DEVICE, Diode	33831-0201	13327 FSCER69-5
CR3-CR7	Same as CR1		
CR8	Same as CR2		
CR9	Same as CR1		
CR10	Same as CR1 (used on 42641 only)		
Q1	TRANSISTOR	34619-0001	79089 type 39293
R1	RESISTOR, Fixed, comp, 10,000 ohms ± 5%, 1/4 W	341-0103	01121 CB1035
R2	RESISTOR, Fixed, comp, 7500 ohms ± 5%, 1/4 W	341-0752	01121 CB7525
R3	Same as R1		
R4	RESISTOR, Fixed, comp, 47,000 ohms ± 5%, 1/4 W	341-0473	01121 CB4735
R5	RESISTOR, Fixed, comp, 1000 ohms ± 5%, 1/4 W	341-0102	01121 CB1025
R6	RESISTOR, Fixed, comp, 100,000 ohms ± 5%, 1/4 W	341-0104	01121 CB1045

ROLL PRINTED WIRING ASSEMBLY A3 (38914-0000)

Reference Des.	Description	Part No.	Manufacturer & Part No.
C1	CAPACITOR, Fixed, Ceramic, 680 pF ±10%, 200 Vdc	30949-0681	72982 Type X5F
C2	CAPACITOR, Fixed, Mylar, .01μF ±10%, 80 Vdc	32423-0103	56289 Type 192P
C3	CAPACITOR, Fixed, Ceramic, 220 pF ±10%, 200 Vdc	30949-0221	72982 Type
C4	Same as C1		
C5	Same as C2		
C6	Same as C3		
C7	CAPACITOR, Fixed, Ceramic, 270 pF ±10%, 200 Vdc	30949-0271	72982 Type X5F
C8	CAPACITOR, Fixed, Tantalum, 23 μF ±20%, 6 Vdc	39175-0230	26769 Type NS
C9	CAPACITOR, Fixed, Tantalum, 5 μF ±20%, 6 Vdc	39175-9501	26796 Type NS
C10	CAPACITOR, Fixed, Ceramic, .001 μF ±10%, 200 Vdc	30949-0102	72982 Type X5F
C11	CAPACITOR, Fixed, Mylar, .022 μF ±10%, 80 Vdc	32423-9223	56289 Type 192P
C12	CAPACITOR, Fixed, Mylar, .1 μF ±1%, 80 Vdc	32423-9102	56289 Type 192P
C13	Same as C12		
C13	CAPACITOR	30949-0681*	
C14	Same as C12		
C14	CAPACITOR	30949-0681*	
C27	Same as C12		
CR1	SEMICONDUCTOR DEVICE, Diode	32689-0005	01295 IN458
CR2	Same as CR1		
CR3	Same as CR1		
CR4	Same as CR1		
CR5	Same as CR1		
CR6	Same as CR1	35079-0002	01295 IN3020
CR7	SEMICONDUCTOR		
CR8	Same as CR7		
CR9	Same as CR7		
CR9	SEMICONDUCTOR	32689-0005*	
CR10	Same as CR7		
CR10	SEMICONDUCTOR	32689-0005*	
Q1	TRANSISTOR	36962-4126	04713 ZN4126
Q2	TRANSISTOR	36961-4124	04713 ZN4124
Q3	Same as Q1		
Q4	Same as Q2		
Q5	Same as Q2		
R1	RESISTOR, Fixed, Comp, 4700 ohms ±5%, 1/4 W	341-0472	01121 Type CB4725
R2	RESISTOR, Fixed, Comp, 91 ohms ±5%, 1/4 W	341-0910	01121 Type CB9105
R3	RESISTOR, Fixed, Comp, 1500 ohms ±5%, 1/4 W	341-0152	01121 Type CB1525
R4	RESISTOR, Fixed, Comp, 150 ohms ±5%, 1/4 W	341-0151	01121 Type CB1515
R5	RESISTOR, Fixed, Comp, 33K ±5%, 1/4 W	341-0333	01121 Type CB3335
R6	Same as R5		

Reference Des.	Description	Part No.	Manufacturer & Part No.
R7	RESISTOR, Fixed, Comp, 3600 ohms ±5%, 1/4 W	341-0362	01121 Type CB3625
R8	RESISTOR, Fixed, Comp, 100 ohms ±5%, 1/4 W	341-0101	01121 Type CB1015
R9	RESISTOR, Fixed, Comp, 15K ±5%, 1/4 W	341-0153	01121 Type CB1535
R10	RESISTOR, Variable, Cermet, 5K ±10%, 1/4 W	38283-0502	ELMET34P502-003
R11	Same as R9		
R12	RESISTOR, Fixed, Comp, 1K ±5%, 1/4 W	341-0102	01121 Type CB1025
R13	RESISTOR, Variable, Cermet, 1K ±10%, 1/4 W	38283-0102	ELMET34P102-003
R14	Same as R13		
R15	Same as R12		
R16	RESISTOR, Fixed, Comp, 5100 ohms ±5%, 1/4 W	341-0512	01121 Type CB5125
R17	Same as R2		
R18	Same as R3		
R19	Same as R4		
R20	RESISTOR, Fixed, Comp, 39K ±5%, 1/4 W	341-0393	01121 Type CB3935
R21	RESISTOR, Fixed, Comp, 3K ±5%, 1/4 W	341-0302	01121 Type CB3025
R22	Same as R8		
R23	Same as R11		
R24	Same as R10		
R25	Same as R9		
R26	Same as R8		
R27	Same as R12		
R28	Same as R3		
R29	RESISTOR, Fixed, Comp, 1800 ohms ±5%, 1/4 W	341-0182	01121 Type CB1825
R30	Same as R13		
R31	RESISTOR, Fixed, Comp, 3900 ohms ±5%, 1/4 W	341-0392	01121 Type CB3925
R32	RESISTOR, Fixed, Comp, 47K ±5%, 1/4 W	341-0473	01121 Type CB4735
R33	RESISTOR, Fixed, Comp, 47 ohms ±5%, 1/4 W	341-0470	01121 Type CB4705
R34	Same as R33		
R35	Same as R32		
R36	RESISTOR, Fixed, Metal Film, 4750 ohms ±1%, 1/4 W	36149-4751	75042 Type T60
R37	Same as R36		
R37	Same as R1		
R38	RESISTOR, Fixed, Comp, 9000 ohms ±5%, 1/4 W	341-0472	01121 Type CB4725
R38	RESISTOR, Fixed, Comp, 91 ohms ±5%, 1/4 W	341-0910*	01121 Type CB9125
R39	Same as R38		
R39	RESISTOR, Fixed, Comp, 91 ohms ±5%, 1/4 W	341-0910*	
R40	Same as R9		
R40	RESISTOR, Fixed, Comp, 91 ohms ±5%, 1/4 W	341-0910*	
R41	RESISTOR, Fixed, Comp, 2200 ohms ±5%, 1/4 W	341-0222	
R41	RESISTOR, Fixed, Comp, 910 ohms ±5%, 1/4 W	341-0910*	

Reference Des.	Description	Part No.	Manufacturer & Part No.
R42	RESISTOR, Fixed, Comp, 2200 ohms ±5%, 1/4 W	341-0222	01121 Type CB2225
R43	Same as R42		
R44	Same as R8		
R45	RESISTOR, Fixed, Comp, 3300 ohms ±5%, 1/4 W	341-0332	01121 Type CB3325
R46	Same as R45		
R47	Same as R8		
R48	RESISTOR, Variable, Cermet, 2K ±10%, 1/2 W	38283-0202	EMET34P202-003
T1	TRANSFORMER, 400H3, Coupling	38267-0000	76095 Type 74-5T
U1	INTEGRATED CIRCUIT	40122	49956 Type RM709D
U2	Same as U1		
U3	INTEGRATED CIRCUIT	38446-0000	79089 Type CA3028A
VR1	SEMICONDUCTOR DEVICE, Diode, Zener	38296-0331	81078 Type 3Z 3.3

*Computer Amplifier Units Serials:

101 thru 104	P/N 37970-1128	175 thru 176	P/N 37970-1028
151	P/N 37970-1028	178 thru 182	P/N 37970-1028
152	P/N 37970-1028	184	P/N 37970-1028
154 thru 157	P/N 37970-1028	186 thru 188	P/N 37970-1028
159	P/N 37970-1028	190	P/N 37970-1028
171 thru 173	P/N 37970-1028		

PITCH PRINTED WIRING ASSEMBLY A4 (38915-0028)

Reference Des.	Description	Part No.	Manufacturer & Part No.
C1	CAPACITOR, Fixed, Mylar, .01 μF ±10%, 80 Vdc	32423-9103	56289 Type 192P
C2	CAPACITOR, Fixed, Ceramic, 220 pF ±10%, 220 Vdc	30949-0221	72982 Type X5F
C3	CAPACITOR, Fixed, Ceramic, 680 pF ±10%, 200 Vdc	30949-0681	72982 Type X5F
C4	Same as C3		
C5	Same as C1		
C6	Same as C2		
C7	CAPACITOR, Fixed, Mylar, .10 μF ±10%, 80 Vdc	32423-9102	56289 Type 192P
C8	Same as C7		
C9	Same as C7		
C10	CAPACITOR, Fixed, Ceramic, 270 pF ±10%, 200 Vdc	30949-0271	92982 Type X5F
C11	CAPACITOR, Fixed, Tantalum, 23 μF ±20%, 6 Vdc	39175-0230	26769 Type NS
C12	CAPACITOR, Fixed, Ceramic, 1000 pF ±10%, 200 Vdc	30949-0102	72982 Type X5F
C12	Same as C3		
C13	CAPACITOR, Fixed, Tantalum, 5μF 20% 6 Vdc	39175-9501	26769 Type NS
C13	Same as C3	30949-0681*	
C20	CAPACITOR, Fixed, Tantalum, 0.6 μF 20%	39175-8602	
CR1	SEMICONDUCTOR DEVICE, Diode	34410	93332 IN270
CR2	Same as CR1		
CR3	SEMICONDUCTOR DEVICE, Diode	32849-0005	01295 IN458
CR4	Same as CR3		
CR5	SEMICONDUCTOR DEVICE, Diode	35079-0002	01295 IN370
CR6	Same as CR5		
CR7	Same as CR3		
CR8	Same as CR3		
Q1	TRANSISTOR	36962-4126	04713 ZN4126
Q2	TRANSISTOR	36961-4124	04713 ZN4124
Q3	Same as Q2		
Q4	Same as Q2		
Q5	Same as Q1		
Q6	Same as Q1		
Q7	Same as Q2		
Q8	TRANSISTOR	37543-3242	79089 ZN3242A
Q9	Same as Q8		
Q10	TRANSISTOR	37287	79089 ZN4037
Q11	Same as Q10		
Q12	TRANSISTOR	34619-0001	79089 39293
Q13	Same as Q12		
R1	RESISTOR, Fixed, Comp, 91 ohms ±5%, 1/4 W	341-0910	01121 Type CB9105
R2	RESISTOR, Fixed, Comp, 1500 ohms ±5%, 1/4 W	341-0152	01121 Type CB1525
R3	RESISTOR, Fixed, Comp, 150 ohms ±5%, 1/4 W	341-0151	01121 Type CB1515
R4	RESISTOR, Fixed, Comp, 100K ±5%, 1/4 W	341-0104	01121 Type CB1045
R5	RESISTOR, Fixed, Comp, 10K ±5%, 1/4 W	341-0103	01121 Type CB1035
R6	RESISTOR, Fixed, Comp, 100 ohms ±5%, 1/4 W	341-0101	01121 Type CB1015

Reference Des.	Description	Part No.	Manufacturer & Part No.
R7	RESISTOR, Fixed, Comp, 15K ±5%, 1/4 W	341-0153	01121 Type CB1535
R8	RESISTOR, Fixed, Comp, 1800 ohms ±5%, 1/4 W	341-0182	01121 Type CB1825
R9	RESISTOR, Variable, Cermet, 5K ±10%, 1/2 W	38283-0502	EMET34P502-003
R10	Same as R7		
R11	RESISTOR, Fixed, Comp, 430 ohms ±5%, 1/4 W	341-0431	01121 Type CB4315
R12	Same as R11		
R13	Same as R8		
R14	Same as R5		
R15	RESISTOR, Fixed, Comp, 5600 ohms ±5%, 1/4 W	341-0562	01121 Type CB 5625
R16	Same as R5		
R17	RESISTOR, Fixed, Comp, 33K ±5%, 1/4 W	341-0333	01121 Type CB3335
R18	Same as R1		
R19	Same as R2		
R20	Same as R3		
R21	RESISTOR, Fixed, Comp, 3K ±5%, 1/4 W	341-0302	01121 Type CB3025
R22	Same as R6		
R23	Same as R7		
R24	Same as R9		
R25	Same as R7		
R26	Same as R6		
R27	RESISTOR, Fixed, Comp, 1K ±5%, 1/4 W	341-0102	01121 Type CB1025
R28	Same as R2		
R29	Same as R8		
R30	RESISTOR, Variable, Cermet, 1K ±10%, 1/2 W	38283-0102	EMET34P102-003
R31	RESISTOR, Fixed, Comp, 3900 ohms ±5%, 1/4 W	341-0392	01121 Type CB3925
R32	RESISTOR, Fixed, Comp, 3300 ohms ±5%, 1/4 W	341-0332	01121 Type CB3325
R33	Same as R32		
R34	Same as R6		
R35	RESISTOR, Fixed, Comp, 2200 ohms ±5%, 1/4 W	341-0222	01121 Type CB2225
R36	Same as R6		
R37	Same as R35		
R38	RESISTOR, Fixed, Comp, 47K ±5%, 1/4 W	341-0473	01121 Type CB4735
R39	RESISTOR, Fixed, Comp, 47 ohms ±5%, 1/4 W	341-0470	01121 Type CB
R40	Same as R39		
R41	Same as R38		
R42	RESISTOR, Fixed, Metal Film, 4750 ohms ±1%, 1/4 W	36149-4751	75042 Type T60
R43	Same as R42		
R44	Same as R5		
R45	Same as R7		
R46	Same as R35		
R47	Same as R9		
R48	Same as R7		
R49	RESISTOR, Fixed, Comp, 220K ±5%, 1/4 W	341-0224	01121 Type CB2245
R50	Same as R39		
R51	Same as R2		
R52	Same as R39		
R53	Same as R49		
R54	Same as R2		
R55	Same as R35		
R56	RESISTOR, Fixed, Comp. 820 ohms ±5%, 1/4 W	341-0821	01121 Type CB8215
R57	Same as R2		
R58	RESISTOR, Fixed, Comp 39K ±5%, 1/4 W (used on 38915-0014)	341-0393	01121 Type CB3935

Reference Des.	Description	Part No.	Manufacturer & Part No.
R58	Same as R4 (used on 38915-0028)		
R59	Same as R56		
R60	RESISTOR, Fixed, Comp, 1.5 ohms ±5%, 1/2 W (used on 38915-0014)	201-9151	01121 Type EB1515
R60	RESISTOR, Fixed, Comp, 10 ohms ±5%, 1/2 W (used on 38915-0028)	201-0100	01121 Type EB1005
R61	Same as R60 (used on 38915-0014)		
R61	RESISTOR, Variable, 100 K ohms ±5%, 1/4 W	33868-0104*	
R62	RESISTOR, Fixed, Comp, 470 ohms ±5%, 1/4 W (used on 38915-0014)	341-0471	01121 Type CB4715
R62	RESISTOR, Fixed, Comp, 2700 ohms ±5%, 1/4 W (used on 38915-0028)	341-0273	01121 Type CB2725
R62	Same as R1	341-0910*	
R63	Same as R60 (used on 38915-0014)		
R63	Same as R60 (used on 38915-0028)		
R63	RESISTOR, Fixed, Comp 5600 ohms ±5%, 1/4 W	341-0562*	
R64	Same as R60 (used on 38915-0014)		
R64	Same as R60 (used on 38915-0028)		
R64	Same as R1	341-0910*	
R65	Same as R62 (used on 38915-0014)		
R65	Same as R62 (used on 38915-0028)		
R66	Same as R58 (used on 38915-0014)		
R67	Same as R4 (used on 38915-0028)		
T1	TRANSFORMER, 400HZ, Coupling	38267	76095 Type 74-57
U1	INTEGRATED CIRCUIT	40122	49965 Type RM709D
U2	Same as U1		
U3	INTEGRATED CIRCUIT	38446	79089 Type CA3028A
U4	Same as U3		

*Computer Amplifier Units Serials:

101 thru 104	P/N 37970-1128	175 thru 176	P/N 37970-1028
151	P/N 37970-1028	178 thru 182	P/N 37970-1028
152	P/N 37970-1028	184	P/N 37970-1028
154 thru 157	P/N 37970-1028	186 thru 188	P/N 37970-1028
159	P/N 37970-1028	190	P/N 37970-1028
171 thru 173	P/N 37970-1028		

ROLL RADIO PRINTED WIRING ASSEMBLY A5 (38916-0028)

Reference Des.	Description	Part No.	Manufacturer & Part No.
C1	CAPACITOR, Fixed, Tantalum 23 μF ±20%, 6Vdc	39175-0250	26769 Type NS
C2	CAPACITOR, Fixed, Tantalum, 90 μF ±20%, 6 Vdc	39175-0900	26769 Type NS
C3	CAPACITOR, Fixed, Mylar, .01 μF ±10%, 80 Vdc	32423-9103	56289 Type 192P
C4	CAPACITOR, Fixed, Ceramic, 220 pF ±10%, 200 Vdc	30949-0221	72982 Type X5F
C5	Same as C3		
C6	CAPACITOR, Fixed, Tantalum, 6.8 μF ±20%, 6 Vdc	8918-9681	56289 Type 150D6.3X0006-2

Reference Des.	Description	Part No.	Manufacturer & Part No.
C7	Same as C3		
C8	Same as C3		
C9	Same as C4		
C10	CAPACITOR, Fixed, Tantalum 41 UF ±10%, 6 Vdc	39175-1410	26769 Type NS
C11	CAPACITOR, Fixed, Tantalum 7.5mfd ±10%	39175-9751	26769- Type NS
CR1	SEMICONDUCTOR DEVICE, Diode	38297	79089 CA3019
CR2	Same as CR1		
CR3	SEMICONDUCTOR DEVICE, Diode	32689-0005	01295 IN458
CR4	Same as CR3		
CR5	Same as CR3		
CR6	Same as CR3		
CR7	Same as CR3		
CR8	Same as CR3		
CR9	SEMICONDUCTOR DEVICE, Thyristor	38293-0045	01295 TIC45
CR10	Same as CR3		
CR11	Same as CR3		
CR12	Same as CR3		
CR13	Same as CR3		
CR14	Same as CR3		
CR15	Same as CR3		
CR16	Same as CR3		
CR17	Same as CR3		
K1	RELAY, DPDT, 12.6 Vdc (used on 38916-0014)	35673-1001	82768 Type 30-07
K1	RELAY, DPDT, 26,5 Vdc (used on 38916-0028)	35673-1004	82768 Type 30-07
Q1	TRANSISTOR	39311	01295 ZN3820
R1	RESISTOR, Fixed, Comp, 22K ±5%, 1/4 W	341-0223	01121 Type CB2235
R2	Same as R1		
R3	Same as R1		
R4	RESISTOR, Variable, Cermet, 5K ±10%, 1/2 W	38283-0502	EMET34P502-003
R5	Same as R1		
R6	Same as R1		
R7	Same as R1		
R8	RESISTOR, Fixed, Comp, 6800 ohms ±5%, 1/4 W	341-0682	01121 Type CB6825
R9	RESISTOR, Fixed, Comp, 20K ±5%, 1/4 W	341-0203	01121 Type CB2035
R10	Same as R9		
R11	RESISTOR, Fixed, Comp, 5100 ohms ±5%, 1/4 W		
R12	RESISTOR, Fixed, Comp, 180 ±5%, 1/4 W	341-0184	01121 Type CB1845
R13	RESISTOR, Variable, Cermet, 1K ±10%, 1/2 W	38283-0102	EMET34P102-003
R14	Same as R13		
R15	RESISTOR, Fixed, Comp, 1500 ohms ±5%, 1/4 W	341-0152	01121 Type CB1525
R16	RESISTOR, Fixed, Comp, 47 ohms ±5%, 1/4 W	341-0470	01121 Type CB4705
R17	RESISTOR, Fixed, Comp, 1300 ohms ±5%, 1/4 W	341-0132	01121 Type CB1325
R18	Same as R17		
R19	RESISTOR, Fixed, Comp, 100 ohms ±5%, 1/4 W	341-0101	01121 Type CB1015
R20	Same as R11		
R21	RESISTOR, Fixed, Comp, 15K ±5%, 1/4 W	341-0153	01121 Type CB1535
R22	Same as R4		
R23	Same as R21		
R24	RESISTOR, Fixed, Comp, 1K ±5%, 1/4 W	341-0102	01121 Type CB1025
R25	Same as R13		
R26	RESISTOR, Fixed, Comp, 10K ±5%, 1/4 W	341-0103	01121 Type CB1035
R27	Same as R26		
R28	RESISTOR, Fixed, Comp, 51K ±5%, 1/4 W	341-0513	01121 Type CB5135
R29	Same as R15		
R30	RESISTOR, Fixed, Comp, 2700 ohms ±5%, 1/4 W	341-0272	01121 Type CB2725
R31	Same as R24		
R32	Same as R17		
R33	RESISTOR, Fixed, Comp, 68K ±5%, 1/4 W	341-0683	01121 Type CB6835

Reference Des.	Description	Part No.	Manufacturer & Part No.
R33	RESISTOR, Fixed, comp, 68,000 ohms ± 5%, 1/4 W (used on 37970-0028, -1028, -1128, -4028, -5028)	341-0683	01121 CB6835
R33	RESISTOR, Fixed, comp, 100,000 ohms ± 5%, 1/4 W (used on 37970-0228, -0328, -1228, -1328, -6028, -7028)	341-0104	01121 CB1045
R34	RESISTOR, Fixed, comp, 68,000 ohms ± 5%, 1/4 W (used on 37970-0028, -0128, -1028, 1128, -4028, -5028)	341-0683	01121 CB6835
R34	RESISTOR, Fixed, comp, 100,000 ohms ± 5%, 1/4 W (used on 37970-0328, -1228, -1328, -6028 -7028)	341-0104	01121 CB1045
R35	Same as R26		
R36	Same as R13		
R37	Same as R26		
R38	Same as R24		
R39	Same as R28		
R40	Same as R15		
R41	Same as R26		
R42	Same as R26		
R43	Same as R15		
R44	RESISTOR, Fixed, comp, 680,000 ohms ± 5%, 1/4 W	341-0684	01121 CB6845
R45	Same as R16		
R46	RESISTOR, Fixed, comp, 3600 ohms ± 5%, 1/4 W	341-0362	01121 CB3625
R47	Same as R24		
R48	RESISTOR, Fixed, comp, 5600 ohms ± 5%, 1/4 W	341-0562	01121 CB5625
R49	RESISTOR, Fixed, comp, 2400 ohms ± 5%, 1/4 W	341-0242	01121 CB2425
R50	RESISTOR, Fixed, comp, 2,000,000 ohms, ± 5%, 1/4 W	341-0205	01121 CB2055
T1	TRANSFORMER, Isolation, 400 Hz	38260	76095 type 74-52
T2	TRANSFORMER, Coupling, 400 Hz	38266	76095 type 74-56
U1	INTEGRATED CIRCUIT	40122	40122 49965 Type RM7090
U2	Same as U1		
U3	INTEGRATED CIRCUIT	38446	79089 Type CA3028A
U4	Same as U3		

Reference Des.	Description	Part No.	Manufacturer & Part No.
R34	Same as R33		
R35	Same as R26		
R36	Same as R13		
R37	Same as R26		
R38	Same as R24		
R39	Same as R28		
R40	Same as R15		
R41	Same as R26		
R42	Same as R26		
R43	Same as R15		
R44	RESISTOR, Fixed, Comp, 680K ±5%, 1/4 W	341-0684	01121 Type CB6845
R45	Same as R16		
R46	Same as R24 (used on 38916-0014)		
R46	RESISTOR, Fixed, Comp, 3600 ohms ±5%, 1/4 W (used on 38916-0028)	341-0362	01121 Type CB3625
R47	RESISTOR, Fixed, Comp, 910 ohms ±5%, 1/4 W (used on 38916-0014)	341-0911	01121 Type CB9115
R47	Same as R24 (used on 38916-0028)		
R48	RESISTOR, Fixed, Comp, 9100 ohms ±5%, 1/4 W (used on 38916-0014)	341-0912	01121 Type CB9125
R48	RESISTOR, Fixed, Comp, 5600 ohms ±5%, 1/4 W (used on 38916-0028)	341-0562	01121 Type CB5625
R49	RESISTOR, Fixed, Comp, 820 ohms ±5%, 1/4 W (used on 38916-0014)	341-0821	01121 Type CB8215
R49	RESISTOR, Fixed, Comp, 2400 ohms ±5%, 1/4 W (used on 38916-0028)	341-0242	01121 Type CB2425
R50	RESISTOR, Fixed, Comp, 2M ±5%, 1/4 W	341-0205	01121 Type CB2055
T1	TRANSFORMER, 400HZ, Isolation	38260	76095 Type 74-52
T2	TRANSFORMER, 400HZ, Coupling	38266	76095 Type 74-56
U1	INTEGRATED CIRCUIT	40122	49965 RM709D
U2	Same as U1		
U3	Same as U1		
U4	Same as U1		

Reference Des.	PITCH RADIO PRINTED WIRING ASSEMBLY A6 (38917-0000) Description	Part No.	Manufacturer & Part No.
	Note The CA-530A model part numbers and the related ("used on") A6 part numbers are as follows: CA-530A — A6 37930-0028, -0328, -1028, -1328, -4028, -7028 — 38917-0028 37970-0128, -0228, -1128, -1228, -5028, -6028 — 38917-0128		
C1	CAPACITOR, Fixed, Tantalum, 23 μF ±20%, 6 Vdc (used on 38917-0014, 38917-0028)	39175-0230	26769 Type NS
C2	CAPACITOR, Fixed, Mylar, .01 μF ±10%, 80 Vdc (used on 38917-0014, 38917-0028)	3423-9103	56289 Type 192P
C3	CAPACITOR, Fixed, Ceramic, 220 pF ±10%, 200 Vdc (used on 38917-0014, 38917-0028)	30949-0221	72982 Type X5F
C4	Same as C2 (used on 38917-0014, 38917-0028)		
C5	Same as C3 (used on 38917-0014, 38917-0028)		
C6	CAPACITOR, Fixed, Tantalum, 6.8 μF ±20%, 6 Vdc (used on 38917-0014, 38917-0028)	8918-9681	56289 Type 150D6.8X0006-2
C7	CAPACITOR, Fixed, Tantalum 6.8 μF ±20%, 6 Vdc	8718-9681	5689 Type 150D6.8X0006-2
C8	CAPACITOR, Fixed, Mylar, .22μF ±10%, 80 Vdc (used on 38917-0014, 38917-0028)	32423-9222	56289 Type 192P
CR1	SEMICONDUCTOR DEVICE, Diode (used on 38917-0014, 38917-0028)	38297	79089 CA3019
CR2	Same as CR1 (used on 38917-0014, 38917-0028)		
CR3	SEMICONDUCTOR DEVICE, Diode	32689-0005	01295 IN458
CR4	Same as CR3		
CR5	Same as CR3		
CR6	SEMICONDUCTOR DEVICE, Thyristor (used on 38917-0014, 38917-0028)	38293-0045	01295 TIC45
CR7	SEMICONDUCTOR DEVICE, Thyristor	38293-0045	01295 TIC45
Q1	TRANSISTOR (used on 38917-0014, 38917-0028)	39311	01295 ZN3820
Q2	TRANSISTOR (used on 38917-0014, 38917-0028)	36961-4124	04713 ZN4124
R1	RESISTOR, Fixed, Comp, 22K ±5%, 1/4 W (used on 38917-0014, 38917-0028)	341-0223	01121 Type CB2735
R2	Same as R1		
R3	Same as R1		
R4	RESISTOR, Variable, Cermet, 5K ±10%, 1/2 W (used on 38917-0014, 38917-0028)	38283-0502	EMET34P502-003
R5	Same as R1		
R6	Same as R1		
R7	Same as R1		

Description		Part No.	Manufacturer & Part No.
Reference Des.	Description	Part No.	Manufacturer & Part No.
R8	RESISTOR, Fixed, Comp, 5600 ohms ±5%, 1/4 W (used on 38917-0014, 38917-0028)	341-0562	01121 Type CB5625
R9	Not Used		
R10	Not Used		
R11	Same as R8		
R12	RESISTOR, Fixed, Comp, 100 ohms ±5%, 1/4 W (used on 38917-0014, 38917-0028)	341-0101	01121 Type CB1015
R13	RESISTOR, Fixed, Comp, 150K ±5%, 1/4 W (used on 38917-0014, 38917-0028)	341-0154	01121 Type CB1545
R14	Not Used		
R15	RESISTOR, Fixed, Comp, 15K ±5%, 1/4 W (used on 38917-0014, 38917-0028)	341-0153	01121 Type CB1535
R16	Same as R4		
R17	Same as R15		
R18	RESISTOR, Fixed, Comp, 10K ±5%, 1/4 W	341-0103	01121 Type CB1035
R19	RESISTOR, Fixed, Comp, 1500 ohms ±5%, 1/4 W (used on 38917-0014, 38917-0028)	341-0152	01121 Type CB1525
R20	RESISTOR, Fixed, Comp, 1500 ohms ±5%, 1/4 W	341-0152	01121 Type CB1525
R21	RESISTOR, Fixed, Comp, 1200 ohms ±5%, 1/4 W	341-0122	01121 Type CB1225
R22	Same as R21		
R23	Not Used		
R24	RESISTOR, Fixed, Comp, 47 ohms ±5%, 1/4 W (used on 38917-0014, 38917-0028)	341-0470	01121 Type CB4705
R25	RESISTOR, Fixed, Comp, 62K ±5%, 1/4 W (used on 38917-0014, 38917-0028)	341-0623	01121 Type CB6235
R26	RESISTOR, Fixed, Comp, 12K ±5%, 1/4 W	341-0123	01121 Type CB1235
R27	Same as R21		
R28	RESISTOR, Fixed, Comp 10K ±5%, 1/4 W (used on 38917-0014, 38917-0028)	341-0103	01121 Type CB1035
R29	RESISTOR, Fixed, Comp, 39K ±5%, 1/4 W (used on 38917-0114)	341-0393	01121 Type CB3935
R29	RESISTOR, Fixed, Comp, 82K ±5%, 1/4 W (used on 38917-0128)	341-0823	01121 Type CB8235
R30	RESISTOR, Fixed, Comp, 5700 ohms ±5%, 1/4 W	341-0512	01121 Type CB5125
R31	RESISTOR, Fixed, Comp, 30K ±5%, 1/4 W (used on 38917-0014, 38917-0028)	341-0303	01121 Type CB3035
R32	Same as R19		
R33	RESISTOR, Fixed, Comp, 16K ±5%, 1/4 W (used on 38917-0014, 38917-0028)	341-0163	01121 Type CB1635
R34	Same as R31		
R35	Same as R24		
R36	RESISTOR, Fixed, Comp, .825 ohms ± 1%, 1/4 W (used on 38917-0014, 38917-0028)	39319-2802	01121 Type CB8215

Reference Des.	Description	Part No.	Manufacturer & Part No.
R36	RESISTOR, Fixed, Comp, 800 ohms ± 5%, 1/4 W (used on 38917-0014, 38917-0028)	341-0821	01121 Type CB8215
R37	RESISTOR, Fixed, Comp, 280 ohms ±1%. 1/4 W (used on 38917-0014, 38917-0028)	39319-2802	01121 Type CB2415
R38	RESISTOR, Fixed, Comp, 680 ohms ±5%, 1/4 W (used on 38917-0014, 38917-0028)	341-0681	01121 Type CB6815
R39	Same as R33		
R40	RESISTOR, Fixed, Comp, 3900 ohms ±5%, 1/4 W (used on 38917-0014, 38917-0028)	341-0392	01121 Type CB3925
R41	Same as R33		
R42	RESISTOR, Fixed, Comp, 1K ±5%, 1/4 W (used on 38917-0014, 38917-0028)	341-0102	91121 Type CB
R43	RESISTOR, Fixed, Comp, 1300 ohms ±5%, 1/4 W (used on 38917-0014, 38917-0028)	341-0132	01121 Type CB
T1	TRANSFORMER, 400HZ, Isolation (used on 38917-0014, 38917-0028)	38260	76095 Type 74-52
T2	TRANSFORMER, 400HZ, Coupling (used on 38917-0014, 38917-0028)	38266	76095 Type 74-56
U1	INTEGRATED CIRCUIT (used on 38917-0014, 38917-0028)	40122	49566 RM709D
U2	INTEGRATED CIRCUIT	38446-0002	79089 CA3028B
U3	Same as U1		
U4	INTEGRATED CIRCUIT	40140	01295 SN15946N
	POWER SUPPLY PRINTED WIRING ASSEMBLY A7 (38918-0028)		
C1	CAPACITOR, Fixed, Mylar, .1μF ±10%, 80 Vdc	32423-9102	56289 Type 192P
C2	Same as C1		
C3	CAPACITOR, Fixed, Mylar, .033μF ±10%, 80 Vdc	32423-9333	56289 Type 192P
C4	CAPACITOR, Fixed, Tantalum, 180 μF ±20%, 6 Vdc	36105-0181	56289 Type 164D
C5	CAPACITOR, Fixed, Mylar, .047 μF ±10%, 80 Vdc	32423-9473	56289 Type 192P
C6	CAPACITOR, Fixed, Tantalum, 3.3 μF ±20%, 15 Vdc	36910-9331	56289 Type 164D
C7	CAPACITOR, Fixed, Tantalum, 120 μF ±20%, 6 Vdc	36135-0121	50289 Type 164D
C8	CAPACITOR, Fixed, Ceramic, 1000 pF ±10%, 200 Vdc	30949-0102	72982 Type X5F
C9	CAPACITOR, Fixed, Tantalum, 15 μF ±20%, 15 Vdc	36910-0150	56289 Type 164D
C10	CAPACITOR, Fixed, Tantalum, 150 μF ±20%, 15 Vdc	36910-0151	56214 Type 164D
C11	Same as C8		
C12	Same as C9		
C13	Same as C10		
C14	Same as C10		
C15	Same as C10		
C16	CAPACITOR, Fixed, Tantalum, 15 μF ±20%, 35 Vdc	21485-0150	
C17	CAPACITOR, Fixed, Tantalum, 10 μF ±20%, 35 Vdc	21485-0100	
CR1	SEMICONDUCTOR DEVICE, Diode	32689-0005	01295 IN458
CR2	Same as CR1		
CR3	Same as CR1		

Reference Des.	Description	Part No.	Manufacturer & Part No.
CR4	Same as CR1		
CR5	Same as CR1		
CR6	Same as CR1		
CR7	SEMICONDUCTOR DEVICE, Diode	38282-0050	06288 B172
Q1	TRANSISTOR	39269-5306	03508 ZN5306
Q2	TRANSISTOR	34619-0001	79089 3923
Q3	TRANSISTOR	36962-4126	04713 ZN4126
Q4	Same as Q3		
Q5	TRANSISTOR	36961-4124	04713 ZN4124
Q6	TRANSISTOR	38362-0410	79089 40410
Q7	Same as Q5		
Q8	Same as Q5		
Q9	Same as Q3		
Q10	TRANSISTOR	38362-0409	79089 40409
R1	RESISTOR, Fixed, Comp, 1K ±5%, 1/4 W	341-0102	01121 Type CB1025
R2	RESISTOR, Variable, Cermet, 2K ±10%, 1/2 W	38283-0202	EMET34P202-003
R3	RESISTOR, Fixed, Comp, 2200 ohms ±5%, 1/4 W	341-0222	0421 Type CB2225
R4	RESISTOR, Fixed, Comp, 15K ±5%, 1/4 W	341-0153	01121 Type CB1535
R5	RESISTOR, Fixed, Comp, 3600 ohms ±5%, 1/4 W	341-0362	01121 Type CB3625
R6	Same as R1		
R7	RESISTOR, Fixed, Comp, 150 ohms ±5%, 1/4 W	341-0151	01121 Type CB1515
R8	RESISTOR, Fixed, Comp, 330 ohms ±5%, 1/4 W	341-0331	01121 Type CB3315
R9	Same as R3		
R10	RESISTOR, Fixed, Comp, 3300 ohms ±5%, 1/4 W	341-0332	01121 Type CB3325
R11	RESISTOR, Fixed, Comp, 2700 ohms ±5%, 1/4 W	341-0272	01121 Type CB2725
R12	RESISTOR, Variable, Cermet, 5K ±10%, 1/2 W	38283-0302	EMET34P502-003
R13	RESISTOR, Fixed, Comp, 39 ohms ±5%, 1/4 W (used on 38918-0014)	341-0390	01121 Type CB3905
R13	RESISTOR, Fixed, Comp, 220 ohms ±5%, 1/4 W (used on 38918-0028)	341-0221	01121 Type CB2215
R14	RESISTOR, Fixed, Comp, 10 ohms ±5%, 1/4 W (used on 38918-0014)	341-0100	01121 Type CB1005
R14	RESISTOR, Fixed, Comp, 33 ohms ±5%, 1/4 W (used on 38918-0028)	341-0330	01121 Type CB3305
R15	RESISTOR, Fixed, WW, 47 ohms ±5%, 3 W (used on 38918-0014)	30188-0470	56289 Type 242E
R15	RESISTOR, Fixed, WW, 430 ohms ±5%, 3 W (used on 38918-0028)	30188-0431	56289 Type 242E
R16	RESISTOR, Fixed, Comp, 10K ±5%, 1/4 W	341-0103	01121 Type CB1035
R17	RESISTOR, Fixed, Comp, 1500 ohms ±5%, 1/4 W	341-0152	01121 Type CB1525
R18	Same as R1		
R19	RESISTOR, Fixed, Comp, 680 ohms ±5%, 1/4 W	341-0681	01121 Type CB6815
R20	RESISTOR, Fixed, Comp, 180 ohms ±5%, 1/4 W	341-0181	01121 Type CB1815
R21	RESISTOR, Variable, Cermet, 500 ohms ±10%, 1/2W	38283-0501	EMET34P501-003
R22	Same as R20		

Reference Des.	Description	Part No.	Manufacturer & Part No.
R3	RESISTOR, Fixed, WW, 82 ohms ±3%, 5 W (used on 37970-0014, 37970-0114)	30068-0820	91637 RH5
R3	RESISTOR, Fixed, WW, 200 ohms ±3%, 5 W (used on 37970-0028, 37970-0128, 37970-1028, 37970-1128)	30068-0201	91637 RH5
R4	RESISTOR, Fixed, Comp, 22 ohms ±10%, 1/2 W (used on 37970-0028, 37970-0128, 37970-1028, 37970-1128)	201-0220	01121 Type CB2205
T1	TRANSFORMER, 400 HZ, Power (37970-0014, 37970-0114)	38261	76095 Type A74-55
T1	TRANSFORMER, 400 HZ, Power (used on 37970-0028, 37970-0128, 37970-1028, 37970-1128)	38304	76095 Type A74-58
VR1	SEMICONDUCTOR DEVICE, Diode, Zener Type	38296-8431	81071 Type SZ 4.3

Reference Des.	Description	Part No.	Manufacturer & Part No.
C6	Same as C2		
C7	Same as C2		
C8	Same as C2		
C9	Same as C2		
C10	Same as C2		
C11	Same as C2		
C12	Same as C2		
C13	Same as C2		
C14	Same as C2		
C15	Same as C2		
C16	Same as C2		
C17	Same as C2		
C18	Same as C2		
C19	Same as C2		
C20	Same as C2		
C21	Same as C2		
J1	CONNECTOR, Receptacle, Electrical	38423-0020	81312 MRAC 34P
J2	CONNECTOR, Receptacle, Electrical	38423-0002	81312 MRAC 14S
J3	CONNECTOR, Receptacle, Electrical	38423-0003	81312 MRAC 14S
J4	CONNECTOR, Electrical	33877-0009	81312 M9S
K1	RELAY, Telephone Type, 12 Vdc (used on 37970-0014, 37970-0114)	38452-0003	24796 Type R10-E1L
K1	RELAY, Telephone Type, 24 Vdc (used on 37970-0028, 37970-0128, 38970-1028, 38970-1128)	38452-0004	24796 Type R10-E1L
K2	RELAY, Telephone Type, 12 Vdc (used on 37970-0014, 37970-0114)	38453-0012	24796 Type R10-E183-3
K2	RELAY, Telephone Type, 24 Vdc (used on 37970-0028, 37970-0128, 37970-1028, 37970-1128)	38453-0024	24796
K3	Same as K1 (used on 37970-0028, 37970-0128, 37970-1028, 37970-1128)		
K4	RELAY, Armature, 12 Vdc (used on 37970-0014, 37970-0114)	38381-0005	24796 Type R10-E552
K4	RELAY, Armature, 12 Vdc (used on 37970-0028, 37970-0128, 37970-1028, 37970-1128)	38381-0006	24796 Type R10-E553
K5	Same as K1 (used on 37970-0014, 37970-0114)		
K5	Same as K1 (used on 37970-0028, 37970-0128, 37970-1028, 37970-1128)		
K6	Same as K1 (used on 37970-0014, 37970-0114)		
K6	Same as K1 (used on 37970-0028, 37970-0128, 37970-1028, 37970-1128)		
Q1	TRANSISTOR	36370-0549	
Q2	Same as Q1		
Q3	Same as Q1		
R1	RESISTOR, Fixed, WW, .47 ohms ±10%, 3 W (used on 37970-0014, 37970-0114)	30700-9472	56289 Type 242E
R1	RESISTOR, Fixed, WW, 1 ohm ±5%, 3 W (used on 37970-0028, 37970-0128, 37970-1028, 37970-1128)	30188-9101	56289 Type 242E
R2	Same as R1 (used on 37970-0014, 37970-0114)		
R2	Same as R1 (used on 37970-0028, 37970-0128, 37970-1028, 37970-1128)		

CROSSWIND INTEGRATOR ASSEMBLY, A10 (Part No. -42622)

Reference Des.	Description	Part No.	Manufacturer
	Note The following CA-530A Model part numbers incorporate assembly A10, 42622: 37970-0228 -0328 -1228 -1328 -6028 -7028		
C1	CAPACITOR, Fixed, tantalum, 41 Mfd ± 10%, 6Vdc, non-polarized	39175-1410	26769 Type NS
CR1	SEMICONDUCTOR DEVICE, Diode	32689-0005	01295 1N458
Q1	TRANSISTOR	39311	01295 2N3820
Q2	TRANSISTOR	41123-0017	25403 A135
Q3	Same as Q1		
Q4	Same as Q2		
R1	RESISTOR, Fixed, comp, 27, 000 ohms ± 5%, 1/4 W	341-0273	01121 CB2735
R2	Same as R1		
R3	RESISTOR, Fixed, comp, 100, 000 ohms ± 5%, 1/4 W	341-0104	01121 CB1045
R4	RESISTOR, Fixed, comp, 130, 000 ohms ± 5%, 1/4 W	341-0134	01121 CB1345
R5	RESISTOR, Fixed, comp, 200, 000 ohms ± 5%, 1/4 W	341-0204	01121 CB2045
R6	RESISTOR, Fixed, comp, 10 megohms ± 5%, 1/4 W	341-0106	01121 CB1065
R7	RESISTOR, Fixed, comp, 330, 000 ohms ± 5%, 1/4 W	341-0334	01121 CB3345
R8	RESISTOR, Variable, metalized ceramic, 10, 000 ohms ± 10%, 1/2 W	38283-0103	80031 ET34P103 003
R9	RESISTOR, Fixed, comp, 470, 000 ohms ± 5%, 1/4 W	341-0474	01121 CB4745
R10	RESISTOR, Fixed, comp, 27, 000 ohms ± 5%, 1/4 W	341-0273	01121 CB2735
R11	Same as R10		
R12	Same as R3		
U1	INTEGRATED CIRCUIT	41753-0006	04173 MC1741G

CONTROL UNIT ASSEMBLY 37960-0028 and 37960-1028

Reference Des.	Description	Part No.	Manufacturer
	Note Reference designations with an asterisk (*) indicate parts which are part of TB1, Printed Wiring Assembly (part no. 39217-0028).		
B2	MOTOR, 24 Vdc	38338-0024	
C1	CAPACITOR, Fixed, Ceramic, .01 Mfd + 20%, 100 Vdc	35188-9103	14655 Type H
C1*	CAPACITOR, Fixed, tantalum, 6.8 Mfd ± 20%, 6 Vdc	8919-9681	56289 150D6, 8X0006-2
C2	Same as C1		
C2*	CAPACITOR, Fixed, ceramic, .001 ,fd ± 10%, 200 Vdc	30949-0102	72982 Z5F
C3*	Same as C2*		
CR1	SEMICONDUCTOR DEVICE, Silicon	32689-0005	01295 1N458
CR1*	SEMICONDUCTOR DEVICE, Zener	35829-9561	81483 1N725
CR2	Same as CR1		
CR2*	Same as CR1*		
DS1	LAMP (nonprocurable;p/o PANEL, part no. 38672-1001)		
J1	CONNECTOR, Electrical:	38423-0015	81312 MRAC
	Connector Body	35860-0014	81312 MRAC 14S
	Contacts (7)	35861-0020	81312 100-51020S
	Guide, Socket	35862-0001	81312 G700
	Guide, Pin	35862-0002	81312 G700
	Lock Tabs	29916-0001	81312 MRE-V
J2	CONNECTOR, Electrical	38423-0004	81312 MRAC
	Connector Body	35860-0134	81312 MRAC 34P
	Contacts (27)	35861-0120	81312 100-1020P
	Guide, Socket	35862-0001	81312 G700
	Guide, Pin	35862-0002	81312 G700
	Lock Tabs	29916-0001	81312 MRE-V
K1	RELAY, DPDT, 26 Vdc	35673-1004	82768 type 30-07
L1	COIL ASSEMBLY (nonprocurable; p/o Switch Assembly P/N38942)		
L2	Not Used		
L3	Same as L1		
L4	Same as L1		
Q1*	TRANSISTOR	34619-0000	79089 2N3053
Q2*	TRANSISTOR	36961-4124	04713 2N4124
Q3*	TRANSISTOR	37987-4275	07263 2N4275
R1	RESISTOR, Variable, ww, 2000 ohms ± 3%, 1W	38302-0202	80294 3510S-74-202
R1*	RESISTOR, Fixed, comp, 8200 ohms ± 5%, 1/2W	201-0822	01121 EB8225
R2	RESISTOR, Variable, dualsection, ww, 2500 ohms ± 20%, 5W	38681	10582 AW-2465 2.5K P&R
R2*	RESISTOR, Fixed, comp, 2200 ohms ± 10%, 1/2W	344-0222	01121 EB2221
R3*	RESISTOR, Fixed, comp, 2700 ohms ± 5%, 1/4 W	341-0272	01121 CB2725
R4*	RESISTOR, Fixed, comp, 620 ohms, ± 5%, 1/4W	341-0621	01121 CB6215
R5	RESISTOR, Fixed, comp, 8200 ohms, ± 5%, 1/4W	341-0822	01121 CB8225

Reference Des.	Description	Part No.	Manufacturer & Part No.
R5	RESISTOR, Fixed, Comp, 8200 ohms ±5%, 1/4 W	341-0822	01121 Type CB8225
R5	RESISTOR, Fixed, Comp, 180 & 8200 ohms ± 5%,	341-0181	01121 Type CB1815
R6	RESISTOR, Fixed, Comp. 4700 ohms ±5%, 1/4 W	341-0472	01121 Type CB4725
R7	RESISTOR, Variable, WW 2K ±3%, 1/2 W	38302-0202	80294 3510S74-202
R8	RESISTOR, Fixed, WW, 200 ohms ±5%, 3 W (used on 37960-1028)	30188-0201	56289 Type 242E
R8	RESISTOR, Fixed, WW 300 ohms ±5%, 3 W (used on 37960-0028)	30188-0301	56289 Type 242E
R9	Same as R8 (used on 37960-1028)		
R9	Same as R8 (used on 37960-0028)		
R10	Same as R8 (used on 37960-1028)		
R10	Same as R8 (used on 37960-0028)		
R11	Same as R7		
R12	RESISTOR, Variable, dual section, WW, 2500 ohms ±5%, 5 W	38681	71450 Type AW24652.5K P&R
S1	SWITCH, Slide, DPDT, 0.5A	38532-0010	79727 Type G126
S2	SWITCH, Slide, DPDT, 0.5A (Non-Procurable) Part of 38942		
S3	SWITCH, (Non-Procurable) Part of 38942		
S4	SWITCH, Push Pull, SPST, 3A (Non-Procurable)		
S5	Same as S2		
S6	Same as S2		
T1	TRANSFORMER, Audio, 150 MW	31239-0106	11700 Type FF-106
TB1	PRINTED WIRING ASSEMBLY, 400 Hz Power Amp	39217-0028	
U1	INTEGRATED CIRCUIT	40140	01295 SN15946N
XK1	SOCKET, Relay	39393-0002	
	PA520A ACTUATOR ASSEMBLY (38100-0128)		
C1	CAPACITOR, Fixed, Mylar, .022 μF ±10% 80 Vdc	32423-9223	56289 Type 192P
C2	Same as C1		
CR1	SEMICONDUCTOR DEVICE, Diode	8931-0401	01295 IN2070
J1	CONNECTOR, Electrical	35860-0114	81312 MRAC14P
	PA520B ACTUATOR ASSEMBLY (40280-0028)		
B1	MOTOR ASSEMBLY	40843	
CR1	DIODE - IN2070	8931-0401	
CR2	DIODE, Bridge	40477-0200	
J1	CONNECTOR, Electric Body	35860-0114	
K1	RELAY	40710	
L1	CLUTCH ASSEMBLY	36920-0028	
VR1	DIODE, Zenier	40284-3309	

S520A HEADING SELECTOR ASSEMBLY (40450-0000)

Reference Des.	Description	Part No.	Manufacturer & Part No.
B1	SYNCHRO, Control Transformer	28884	86197 Type CTC10AS4A197
DS1	LAMP, Incandescent, 14 V, White	31481-0140	MURA TL6
J1	CONNECTOR, Receptacle	28325-0009	02660 Type 126219
R1	RESISTOR, Fixed, Comp, 270 ohms ±5%, 1 W	202-0271	01121 Type GB2715

DT520A PITCH TRIM SENSOR ASSEMBLY (37580-1038)

Reference Des.	Description	Part No.	Manufacturer & Part No.
C1	CAPACITOR, Fixed Tantalum, 150 μF ±20%	40248-2215	
C2	Same as C1		
R1	RESISTOR, Fixed Comp, 18K ohms ±5%	201-0183	01121 Type EB1835
R2	RESISTOR, Fixed Comp, 36K ohms ±5%	201-0363	01121 Type EB1365
R3	RESISTOR, Fixed Comp, 1600 ohms ±5%	201-0160	01121 Type EB1165
R4	RESISTOR, VAR Comp, 500 ohms ±5%	35955-0501	
R5	Same as R1		
R6	Same as R2		
R7	Same as R3		
R8	Same as R4		
R9	RESISTOR, Fixed Comp 200 ohms ±5%	201-0200	01121 Type EB1205
R10	Same as R9		
Q1	TRANSISTOR	40721-5086	2N5086
Q2	TRANSISTOR	40721-4906	2N4906
Q3	TRANSISTOR	40721-4915	2N4915
Q4	Same as Q2		
Q5	Same as Q3		
Q6	Same as Q1		
Q7	TRANSISTOR	37987-4275	2N4275
Q8	Same as Q7		

Refere Des.
C1
C2
C3
C4
C5
C6
C7
C8
C9
E1
J1
J2
P1
Q1
Q2
Q3
Q4
Q5
Q6
R1
R2
R2
R3
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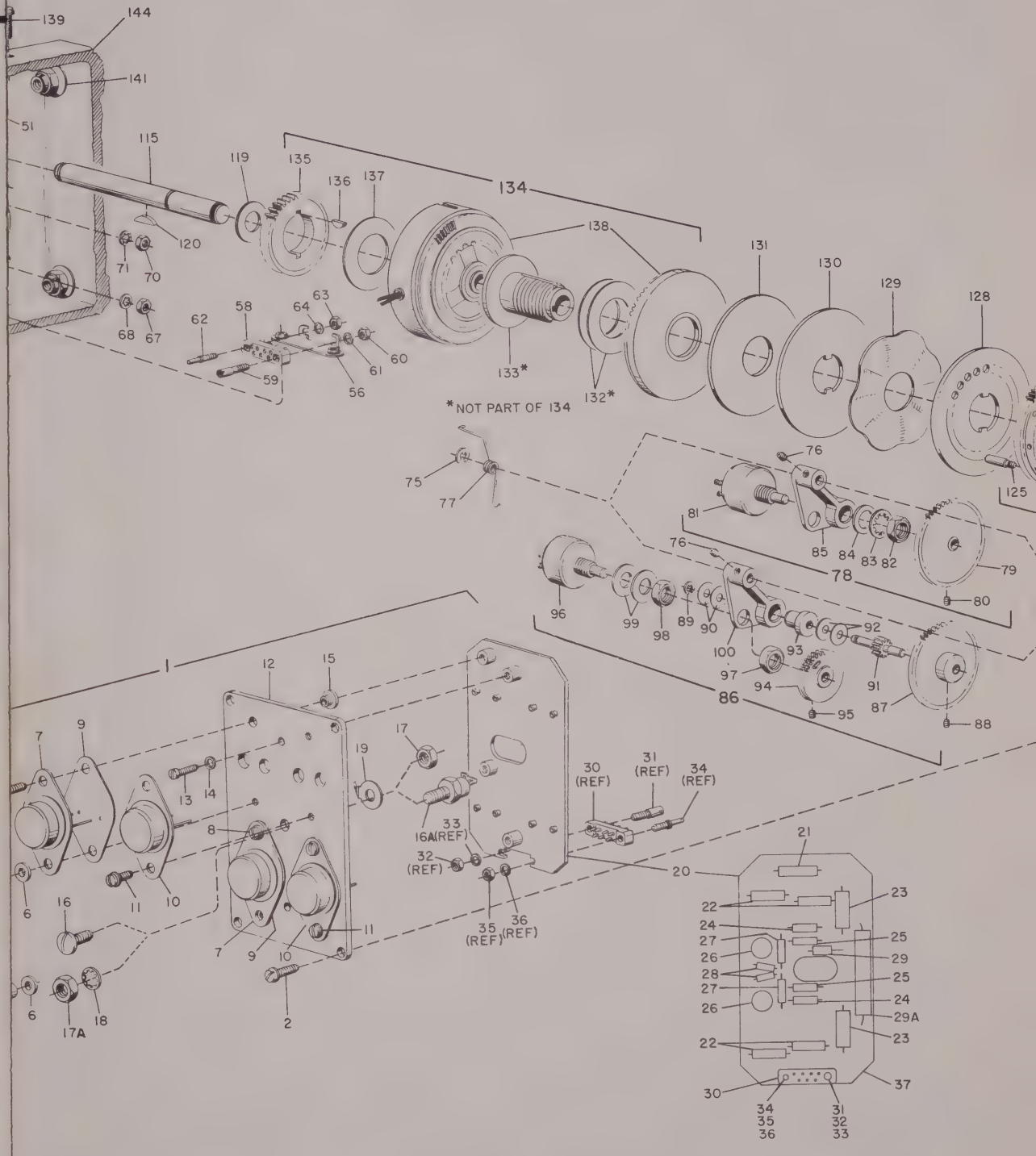

DT520A PITCH TRIM SENSOR ASSEMBLY (37580-1038)

Reference Des.	Description	Part No.	Manufacturer & Part No.
C1	CAPACITOR, Fixed Tantalum, 150 μF ±20%	40248-2215	
C2	Same as C1		
R1	RESISTOR, Fixed Comp, 18K ohms ±5%	201-0183	01121 Type EB1835
R2	RESISTOR, Fixed Comp, 36K ohms ±5%	201-0363	01121 Type EB1365
R3	RESISTOR, Fixed Comp, 1600 ohms ±5%	201-0160	01121 Type EB1165
R4	RESISTOR, VAR Comp, 500 ohms ±5%	35955-0501	
R5	Same as R1		
R6	Same as R2		
R7	Same as R3		
R8	Same as R4		
R9	RESISTOR, Fixed Comp 200 ohms ±5%	201-0200	01121 Type EB1205
R10	Same as R9		
Q1	TRANSISTOR	40721-5086	2N5086
Q2	TRANSISTOR	40721-4906	2N4906
Q3	TRANSISTOR	40721-4915	2N4915
Q4	Same as Q2		
Q5	Same as Q3		
Q6	Same as Q1		
Q7	TRANSISTOR	37987-4275	2N4275
Q8	Same as Q7		

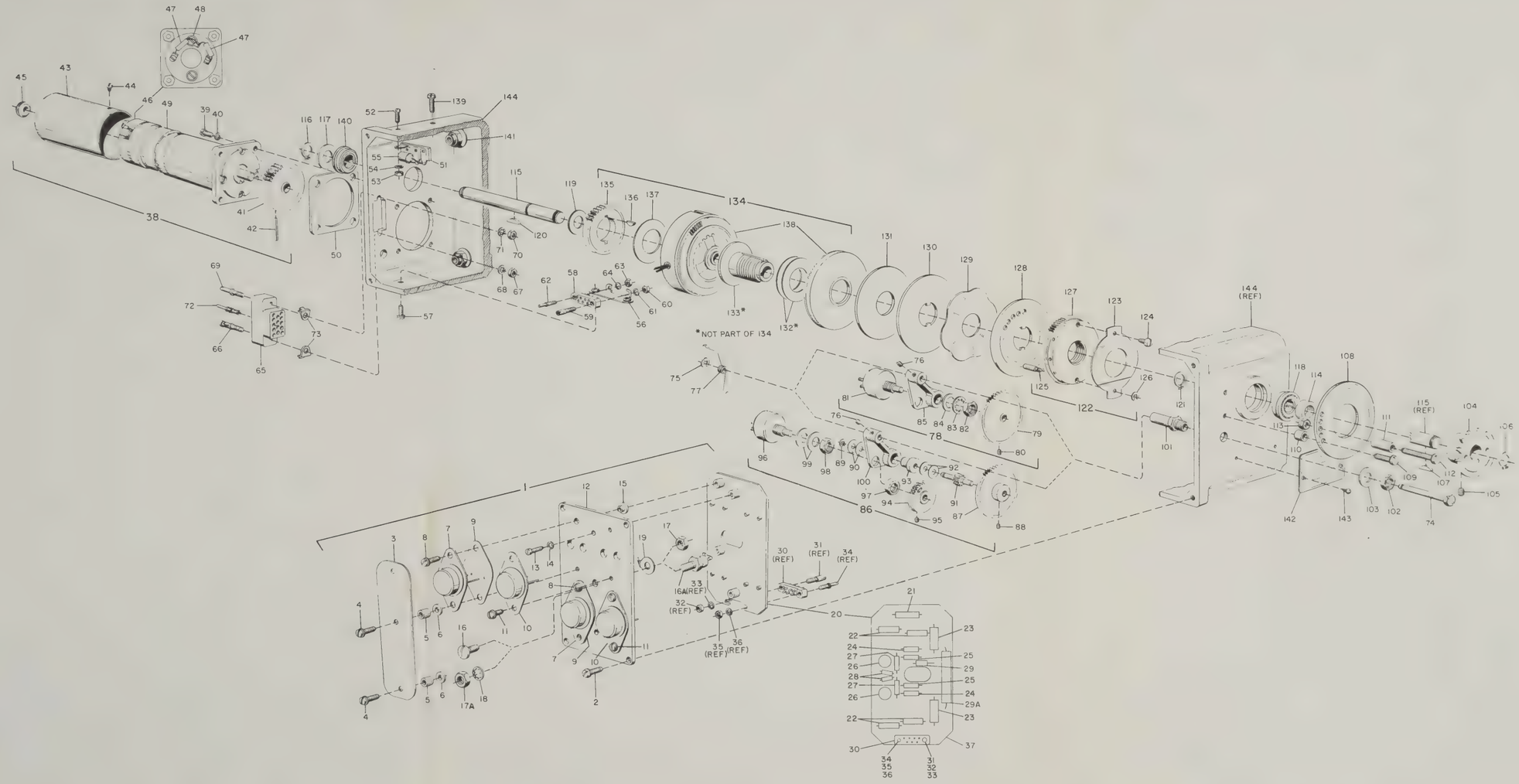

Figure 7-1. PA500A Actuator Exploded View

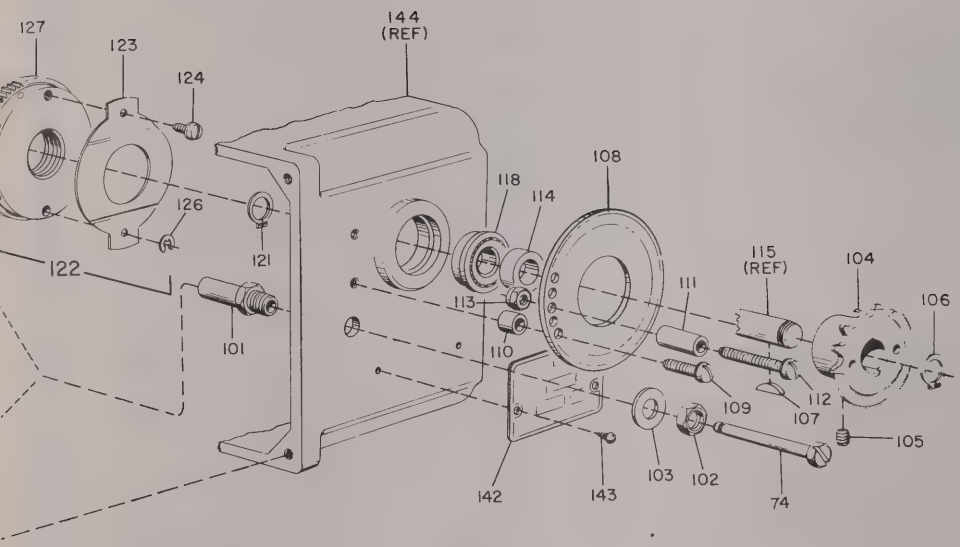
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Figure & Index No.	Part No.	Description 1 2 3 4 5 6	Qty per Assy
7-1	35070-0028	ACTUATOR ASSEMBLY, PA500A, 28 V	
	35070-0128	ACTUATOR ASSEMBLY, PA500A, 28 V	
	35070-0228	ACTUATOR ASSEMBLY, PA500A, 28 V	
	35070-0328	ACTUATOR ASSEMBLY, PA500A, 28 V	
	35070-0428	ACTUATOR ASSEMBLY, PA500A, 28 V	
	35070-1028	ACTUATOR ASSEMBLY, PA500A, 28 V	
	35070-1128	ACTUATOR ASSEMBLY, PA500A, 28 V	
	35070-1228	ACTUATOR ASSEMBLY, PA500A, 28 V	
	35070-0014	ACTUATOR ASSEMBLY, PA500A, 14 V	
	35070-1014	ACTUATOR ASSEMBLY, PA500A, 14 V	
	35070-1114	ACTUATOR ASSEMBLY, PA500A, 14 V	
	35070-1214	ACTUATOR ASSEMBLY, PA500A, 14 V	
-1	36941-0014	. PLATE ASSEMBLY (used on 35070-0014)	1
	36941-0028	. PLATE ASSEMBLY (used on 35070-0028, 35070-0128, 35070-0228, 35070-0328, 35070-0428)	1
	36941-1028	. PLATE ASSEMBLY (used on 35070-1028, 35070-1128, 35070-1228)	1
	36941-1014	. PLATE ASSEMBLY (used on 35070-1014, 35070-1114, 35070-1214)	1
		ATTACHING PARTS	
-2	506-0024	. SCREW ASSEMBLY, Stainless steel washer behind head, nickel plated brass screw 6-32 thread by 3/8 in. length	4
		---*---	
-3	38390	. . INSULATOR	1
		ATTACHING PARTS	
-4	504-0032	. . SCREW ASSEMBLY, Stainless steel washer behind head, nickel plated brass screw 6-32 thread by 3/8 in. length	2
		---*---	
-5	11884-0000	. . SPACER	2
-6	29269-0008	. . INSULATOR, Bushing	2
-7	38404-4915	. . TRANSISTOR (04713 Type ZN4195)	2
		ATTACHING PARTS	
-8	504-0016	. . SCREW ASSEMBLY, Washer behind head, stainless steel lockwasher, brass screw nickel plated 4-40 thread 1/4 in. length	2
		---*---	
-9	27976	. . INSULATOR, Plate (P/N 34 Mfd by 84682)	2
-10	38403-4906	. . TRANSISTOR (Type ZN4915 Mfd by 04713)	2
		ATTACHING PARTS	
-11	504-0016	. . SCREW ASSEMBLY, Washer behind head, stainless steel lockwasher, nickel plated brass screw 4-40 in. 1/4 length (Type SEMS Mfd by 71189)	4
		---*---	
-12	36848-0001	. . PLATE	1
		ATTACHING PARTS	
-13	164-0028	. . SCREW, Machine, nickel plated brass 4-40 thread by 7/16 in. length	2
-14	22341	. . WASHER, Lock, Split, stainless steel	2
		---*---	
-15	29269-0008	. . INSULATOR, Bushing	2
-16	109-0020	. . SCREW, Machine, nickel plated brass 10-32 thread 5/16 in. length (used on 36941-0014, 36941-0028)	1
-16A	26052-9821	. . SEMICONDUCTOR DEVICE, Diode (Type · 10M8. 2Z10 used on 36941-1014, 36941-1028)	1
		ATTACHING PARTS	

Reference Des.	Description	Part No.	Manufacturer & Part No.
	DT520A PITCH TRIM SENSOR ASSEMBLY (37580-0028 AND 37580-1028)		
C1	CAPACITOR, Fixed, Tantalum 330 μF ±20%, 6 Vdc	8918-0331	56289 Type 150D330X0006-2
C2	Same as C1		
C3	CAPACITOR, Fixed, Tantalum, 10 μF ±20%,	8914-0100	56289 Type 150D330X0020-2
C4	Same as C1		
C5	Same as C1		
C6	CAPACITOR, Fixed, Ceramic, .01 μF ±20%, 250 Vdc	35188-9103	14655 Type H
C7	Same as C6		
C8	CAPACITOR, Fixed, Electrolutic, 1500 μF $^{+100\%}_{-10}$ 4 Vdc (used on 37906-1028)	38268-0402	73445 Type ET152X004A01
C9	Same as C8		
E1	CONTACT UNIT ASSEMBLY	37939	
J1	CONNECTOR ASSEMBLY, Receptacle	38313-0001	
J2	CONNECTOR, Receptacle, Electrical	28325-0007	
P1	CONNECTOR ASSEMBLY, Plug	38313-0002	
Q1	TRANSISTOR	34619-0001	
Q2	TRANSISTOR	38403-4906	04713 ZN4906
Q3	TRANSISTOR	38404-4915	04713 ZN4915
Q4	Same as Q1		
Q5	Same as Q2		
Q6	Same as Q1		
R1	RESISTOR, Fixed, Comp 3300 ohms ±5%, 1/2 W	201-0332	01121 Type EB3325
R2	RESISTOR, Fixed, Comp, 15K ±5%, 1/2 W (used on 37906-0014)	201-0153	01121 Type EB1535
R2	RESISTOR, Fixed, Comp, 33K ±5%, 1/2 W (used on 37906-0028, 37906-1028)	201-0333	01121 Type 3335
R3	RESISTOR, Fixed, Comp, 10 ohms ±5%, 1/2 W	201-0100	01121 Type 1005
R4	RESISTOR, Fixed, Comp, 180 ohms ±5%, 1 W (used on 37906-0014)	202-0181	01121 Type GB1815
R4	RESISTOR, Fixed, Comp, 470 ohms ±5%, 1 W (used on 37906-0028, 37906-1028)	202-0471	01121 Type GB4715
R5	RESISTOR, Fixed, WW, .47 ohms ±10%, 3 W (used on 37906-0014)	30700-9472	56289 Type 242E
R5	RESISTOR, Fixed, WW, 2.2 ohms ±3%, 3 W (used on 37906-0028, 27906-1028)	209-9221	
R6	Same as R5 (used on 37906-0014)		
R6	Same as R5 (used on 37906-0028, 37906-1028)		
R7	Same as R5 (used on 37906-0014)		
R7	Same as R5 (used on 37906-0028, 37906-1028)		
R8	Same as R5 (used on 37906-0014)		
R8	Same as R5 (used on 37906-0028, 37906-1028)		
R9	Same as R3		
R10	Same as R4 (used on 37906-0014)		
R10	Same as R4 (used on 37906-0028, 37906-1028)		
R11	Same as R1		
R12	Same as R2 (used on 37906-0014)		
R12	Same as R2 (used on 37906-0028, 27906-1028)		

Reference Des.	Description	Part No.	Manufacturer & Part No.
	DT520A PITCH TRIM SENSOR ASSEMBLY (37580-0028 AND 37580-1028)		
C1	CAPACITOR, Fixed, Tantalum 330 μF ±20%, 6 Vdc	8918-0331	56289 Type 150D330X0006-2
C2	Same as C1		
C3	CAPACITOR, Fixed, Tantalum, 10 μF ±20%,	8914-0100	56289 Type 150D330X0020-2
C4	Same as C1		
C5	Same as C1		
C6	CAPACITOR, Fixed, Ceramic, .01 μF ±20%, 250 Vdc	35188-9103	14655 Type H
C7	Same as C6		
C8	CAPACITOR, Fixed, Electrolutic, 1500 μF $^{+100\%}_{-10}$ 4 Vdc (used on 37906-1028)	38268-0402	73445 Type ET152X004A01
C9	Same as C8		
E1	CONTACT UNIT ASSEMBLY	37939	
J1	CONNECTOR ASSEMBLY, Receptacle	38313-0001	
J2	CONNECTOR, Receptacle, Electrical	28325-0007	
P1	CONNECTOR ASSEMBLY, Plug	38313-0002	
Q1	TRANSISTOR	34619-0001	
Q2	TRANSISTOR	38403-4906	04713 ZN4906
Q3	TRANSISTOR	38404-4915	04713 ZN4915
Q4	Same as Q1		
Q5	Same as Q2		
Q6	Same as Q1		
R1	RESISTOR, Fixed, Comp 3300 ohms ±5%, 1/2 W	201-0332	01121 Type EB3325
R2	RESISTOR, Fixed, Comp, 15K ±5%, 1/2 W (used on 37906-0014)	201-0153	01121 Type EB1535
R2	RESISTOR, Fixed, Comp, 33K ±5%, 1/2 W (used on 37906-0028, 37906-1028)	201-0333	01121 Type 3335
R3	RESISTOR, Fixed, Comp, 10 ohms ±5%, 1/2 W	201-0100	01121 Type 1005
R4	RESISTOR, Fixed, Comp, 180 ohms ±5%, 1 W (used on 37906-0014)	202-0181	01121 Type GB1815
R4	RESISTOR, Fixed, Comp, 470 ohms ±5%, 1 W (used on 37906-0028, 37906-1028)	202-0471	01121 Type GB4715
R5	RESISTOR, Fixed, WW, .47 ohms ±10%, 3 W (used on 37906-0014)	30700-9472	56289 Type 242E
R5	RESISTOR, Fixed, WW, 2.2 ohms ±3%, 3 W (used on 37906-0028, 27906-1028)	209-9221	
R6	Same as R5 (used on 37906-0014)		
R6	Same as R5 (used on 37906-0028, 37906-1028)		
R7	Same as R5 (used on 37906-0014)		
R7	Same as R5 (used on 37906-0028, 37906-1028)		
R8	Same as R5 (used on 37906-0014)		
R8	Same as R5 (used on 37906-0028, 37906-1028)		
R9	Same as R3		
R10	Same as R4 (used on 37906-0014)		
R10	Same as R4 (used on 37906-0028, 37906-1028)		
R11	Same as R1		
R12	Same as R2 (used on 37906-0014)		
R12	Same as R2 (used on 37906-0028, 27906-1028)		

Figure & Index No.	Part No.	Description 1 2 3 4 5 6	Qty per Assy
-17	4180	. . NUT, Hexagon, brass nickel plated 10-32 thread (used on 36941-0014, 36941-0028)	1
-17A		. . NUT, Hexagon, 10-32 thread (supplied with Z6852-9821)	1
-18		. . WASHER, Lock (supplied with 26052-9821)	1
		---*---	
-19	38413-1900	. . TERMINAL, Lug (666 Mfd by 79963)	1
-20	36926-0014	. . PRINTED CIRCUIT ASSEMBLY (used on 36941-0014)	1
	36926-0028	. . PRINTED CIRCUIT ASSEMBLY (used on 36941-0028)	1
	36926-1014	. . PRINTED CIRCUIT ASSEMBLY (used on 36941-1014)	1
	36926-1028	. . PRINTED CIRCUIT ASSEMBLY (used on 36941-1028)	1
-21	209-0180	. . . RESISTOR, Fixed, WW, 180 ohms ±3%, 3 W (used on 36926-1014)	1
	209-0201	. . . RESISTOR, Fixed, WW, 200 ohms ±3%, 3 W (used on 36926-1028)	1
-22	30700-9472	. . . RESISTOR, Fixed, WW, 0.47 ohms ±3%, 3 W (Type 242E, Mfd by 56289 used on 36926-0014, 36926-1014)	4
	209-9221	. . . RESISTOR, Fixed, WW, 2.2 ohms ±3%, 3 W (used on 36926-0028, 36926-1028)	4
-23	202-0181	. . . RESISTOR, Fixed, Comp, 180 ohms ±5%, 1W (Type GB01815, Mfd by 01121, used on 26926-0014, 36926-1014)	2
	202-0471	. . . RESISTOR, Fixed, Comp, 470 ohms ±5%, 1W (Type GB04715, Mfd by 01121, used on 36926-0028, 36296-1028)	2
-24	201-0472	. . . RESISTOR, Fixed, Comp, 4700 ohms ±5%, 1/2 W (Type EB4725, Mfd by 01121, used on 36926-0014, 36926-1014)	2
	201-0223	. . . RESISTOR, Fixed, Comp, 2200 ohms ±5%, 1/2 W (Type EB02235, Mfd by 01121, used on 36926-0028, 36926-1028)	2
-25	201-0471	. . . RESISTOR, Fixed, Comp, 470 ohms ±5%, 1/2 W (Type EB4715, Mfd by 01121, used on 36926-0014, 36926-1014)	2
	201-0102	. . . RESISTOR, Fixed, Comp, 1000 ohms ±5%, 1/2 W (Type EB01025, Mfd by 01121, used on 36926-0028, 36926-1028)	2
-26	34619-0001	. . . TRANSISTOR (Type 39293, Mfd by 79089)	2
-27	201-0102	. . . RESISTOR, Fixed, Comp, 1000 ohms ±5%, 1/2 W (Type EB1025 Mfd by 01121)	2
-28	35188-9103	. . . CAPACITOR, Fixed, Ceramic, 0.01 μF ±20%, 100 Vdc (Type H, Mfd by 14655)	2
-29	8914-0100	. . . CAPACITOR, Fixed, electrolytic, 10 μF ±20%, 20 Vdc (150D200B1, Mfd by 56289) used on 36929-0014, 36929-1014)	1
	8924-0100	. . . CAPACITOR, Fixed, electrolytic, 10 μF ±20%, 50 Vdc (109D106X0050C2, Mfd by 56289, used on 36926-0028, 36926-1028)	1
-29A	40465-0110	. . . CAPACITOR, Fixed, Tantalum, 11 μF ±20%, 35 Vdc @ +85°C (Type NS Mfd by 26769)	1
-30	38311-1007	. . . CONNECTOR, Electrical (Type SR7MP, Mfd by 81312)	1
		ATTACHING PARTS	
-31	38312-0001	. . . GUIDE, Socket (Type N100S, Mfd by 81312)	1
-32		. . . NUT, Hexagon, brass, cadiplate, 2-56 thread (supplied with 38312-0001)	1

Figure & Index No.	Part No.	Description 1 2 3 4 5 6	Qty per Assy
-33		. . . WASHER, Lock, Split, brazed, gold plate (supplied with 38312-0001)	1
-34	38312-0002	. . . GUIDE, Pin (Type N100P, Mfd by 81312)	1
-35		. . . NUT, Hexagon, brass, cad plate, 2-56 thread (supplied with 38312-0001)	1
-36		. . . WASHER, Lock, Split, brass, gold plate (supplied with 38312-0001)	1
		---*---	
-37	36945	. . . BOARD, Printed circuit	1
-38	36921-0014	. MOTOR ASSEMBLY (used on 35070-0014, 35070-1014, 35070-1114)	1
	36921-0028	. MOTOR ASSEMBLY (used on 35070-0028, 35070-0228, 35070-1028, 35070-1228)	1
	36921-1028	. MOTOR ASSEMBLY (used on 35070-0128, 35070-1128)	1
	36921-3028	. MOTOR ASSEMBLY (used on 35070-0328)	1
	36921-4028	. MOTOR ASSEMBLY (used on 35070-0428)	1
	36921-1014	. MOTOR ASSEMBLY (used on 35070-1214)	1
		ATTACHING PARTS	
-39	104-0024	. SCREW, Machine, washer behind head, brass, nickel plated, 4-40 thread by 3/8 in. length	4
-40	8543	. WASHER, Lock, Split, brazed, nickel plate, 0.115 I. D. by 0.162 O. D. by 0.031 in. thick	4
		---*---	
-41	36776	. . GEAR, Spur	1
		ATTACHING PARTS	
-42	216-0040	. . PIN, Grooved, headless, 5/8 in. length (GPIO93 x 625-5 Mfd by 73957)	1
		---*---	
-43	36780-0000	. . COVER	1
		ATTACHING PARTS	
-44	8956-2010	. . SCREW, Tapping, thread forming, steel, black oxidized (No. 2 by 5/32 in. length Type Z Mfd by 45772)	1
		---*---	
-45	11584	. . GROMMET, Rubber 3/16 I. D. by 7/16 O. D. by 3/16 in. thick (428 Mfd by 91265)	1
-46	36874-1201	. . GEAR MOTOR, D. C. (CLL319A213, Mfd by 25140 used on 36921-0014)	1
	36874-2401	. . GEAR MOTOR, D. C. (CLL319A214, Mfd by 25140 used on 36921-0028)	1
	36874-2402	. . GEAR MOTOR, D. C. (CMM317A218, Mfd by 25140 used on 36921-1028)	1
	36874-2404	. . GEAR MOTOR, D. C. (CMM317A142-2, Mfd by 25140 used on 36921-3028)	1
	36874-2405	. . GEAR MOTOR, D. C. (CMM317A142-1, Mfd by 25140 used on 36921-4028)	1
-47	32423-9223	. . CAPACITOR, Fixed plastic 0.022 μF ±10%, 80 Vdc (192P, Mfd by 56289)	2
-48	5216	. . TERMINAL, Lug	1
-49	8774-0016	. . TAPE, Electrical, 7-1/4 in. length x 1/4 in. width (Type 56, Mfd by 76381)	1
-50	30388	. WASHER, Aluminum	
-51	50184-0021	. TERMINAL BOARD	
		ATTACHING PARTS	
-52	113-0024	. SCREW, Maching, washer behind head brass, black oxidized, 3-48 thread by 3/8 in. length	1
-53	4561	. NUT, Hexagon brass, nickel plate, 3-48 thread by 0.062 in. thick	1

Figure & Index No.	Part No.	Description 1 2 3 4 5 6	Qty per Assy
-54		. WASHER, Lock Stainless steel 0.105 I.D. by 0.220	1
	4103	O.D. by 0.025 in. thick (1703 Mfd by 78189	
		---*---	
-55	8931-0401	. SEMICONDUCTOR DEVICE, Diode ..... (IN2070, Mfd by 01295)	1
	33831-0401	. SEMICONDUCTOR DEVICE, Diode ..... (13327 type FSCER70-5)	1
-56	38625	. BRACKET ASSEMBLY	1
		ATTACHING PARTS	
-57	514-0020	. SCREW ASSEMBLY, Washer behind head ..... block oxidized, 4-40 thread by 5/16 in. length (SEMS Mfd by 781-89)	2
		---*---	
-58	38311-0007	. CONNECTOR, Electrical (SRM7S, Mfd ..... by 81312)	1
		ATTACHING PARTS	
-59	38312-0001	. GUIDE, Socket (N100S Type 81312)	1
-60		. NUT, Hexagon, brass, cad plate, ... 2-56 thread (supplied with 38312-0001)	1
-61		. WASHER, Lock, Split, braze, gold plate ..... (supplied with 38312-0001)	1
-62	38312-0002	. GUIDE, Pin (N100P Mfd by 81312)	1
-63		. NUT, Hexagon, brass, cad plate, 2-56 ..... thread (supplied with 38312-0001)	1
-64		. WASHER, Lock, split, brass, gold plate ..... (supplied with 38312-0002)	1
		---*---	
-65	35860-0114	. BODY, Electrical connector (MRAC14P ..... Mfd by 8312)	1
		ATTACHING PARTS	
-66	35862-0001	. GUIDE, Socket, (G700 Mfd by 81312)	1
-67		. NUT, Hexagon, brass, gold plate, ... 4-40 (supplied with 35862-0001)	1
-68		. WASHER, Lock, brass, gold plate, No. 4 ..... (supplied with 35862-0001)	1
-69	35862-0002	. GUIDE, Pin (G700 Mfd by 81312)	
-70		. NUT, Hexagon, brass, gold plate, 4-40 ..... thread (supplied with 35862-0002)	1
-71		. WASHER, Lock, brass, gold plate, No. 4 ..... (supplied with 35862-0002)	1
		---*---	
-72	35861-1114	. CONTACT, Electrical (100-2514P Mfd ..... by 81312)	10
-73	29916-0001	. LOCK, Connector (MREV Mfd by 8132)	2
-74	38191	. SHAFT	1
		ATTACHING PARTS	
-75	30323-0014	. RING, Retaining (5133-14MD Mfd by ..... 79136)	1
-76	304-0008	. SET SCREW, Fluted socket center, cup ..... point, steel cad plate, 4-40 thread by 1/8 in. length	2
		---*---	
-77	36781	. SPRING	1
-78	36988	. GEAR ASSEMBLY (used on 35070-0014, ... 35070-0028, 35070-0128, 35070-1014, 35070-1028, 35070-1014, 35070-1028, 35070-1128, 35070-1114, 35070-1214)	1
-79	36932	. . GEAR, Spur	1
		ATTACHING PARTS	
-80	304-0008	. . SETSCREW, Fluted socket drive, cup ..... point, steel, cad plate 4-40 thread by 1/8 in. length	2
		---*---	

Figure & Index No.	Part No.	Description 1 2 3 4 5 6	Qty per Assy
-81	28613-1502	. . RESISTOR, Variable, WW, 5000 ohms ±10%, 1 W	1
		ATTACHING PARTS	
-82		. . NUT, Hexagon, 1/4-32 thread (supplied with 28613-1502)	1
-83		. . WASHER, Lock (supplied with 28613-1502)	1
-84		. . WASHER, Flat (supplied with 28613-1502)	1
		---*---	
-85	36843	. . LEVER	1
-86	36987	. GEAR ASSEMBLY (used on 35070-0228, 35070-0328, 35070-1228)	1
-87	36932	. . GEAR, Spur	1
		ATTACHING PARTS	
-88	304-0008	. . SETSCREW, Fluted socket drive, cup point, steel cad plate, 4-40 thread by 1/8 in. length	2
		---*---	
-89	30323-0012	. . RING, Retaining (5133-12MD Mfd by 79136)	1
-90	23193	. . WASHER, Flat, stainless steel, 0.125 I.D. by 0.344 O.D. by 0.003 in. thick	AR
-91	33359	. . GEAR, Pinion	1
-92	23193	. . WASHER, Flat, stainless steel, 0.125 I.D. by 0.344 O.D. by 0.003 in. thick	2
-93	36991	. . BEARING	1
-94	35085	. . GEAR ASSEMBLY	1
		ATTACHING PARTS	
-95	304-0008	. . SETSCREW, Fluted socket drive cup point, steel, cad plate, 4-40 thread by 1/8 in. length	2
		---*---	
-96	28613-2505	. . RESISTOR, Variable, WW, 5000 ohms ±10%, 1 W	1
		ATTACHING PARTS	
-97		. . NUT, Hexagon, brass, cad plate, 1/4-32 thread by 0.094 in. thick (supplied with 28613-1502)	1
-98	27317-2502	. . NUT, Hexagon, brass, cad plate, 1/4-32 thread by 0.094 in. thick	1
-99	16088	. . WASHER, Flat, brass, nickel plate 0.0257 I.D. by 0.500 O.D. by 0.032 in. thick	2
		---*---	
-100	36843	. . LEVER	1
-101	38192	. POST	1
		ATTACHING PARTS	
-102	27317-2502	. NUT, Hexagon, brass, cad plate, 1/4-32 thread by 0.094 in. thick	1
-103	16088	. WASHER, Flat, brass, nickel plate 0.027 I.D. by 0.0500 O.D. by 0.032 in. thick	1
		---*---	
-104	28324-0000	. SPROCKET	1
		ATTACHING PARTS	
-105	309-0012	. SETSCREW, Fluted socket drive cup point, steel cad plate, 10-32 thread by 3/16 in. l length	1
-106	28665-0031	. RING, Retaining (S100-31MD Mfd by 79136)	1
-107	36785-0005	. KEY, Woodruff, Steel	1
		---*---	
-108	36783	. PLATE, Guard	1
		ATTACHING PARTS	

Figure & Index No.	Part No.	Description	Qty per Assy
-109	504-0032 504-0028	. SCREW ASSEMBLY, Washer behind head, brass .... nickel plated stainless steel, lock washer, 4-40 thread by 1/2 in. length (SEMS Mfd by 78189)	2
-110	29609-0016	. SPACER	2
-111	29609-0040 29609-0044	. SPACER	2
-112	504-0056	. SCREW ASSEMBLY, Washer behind head, ... brass, nickel plated screw, stainless steel lock washer, 4-40 thread by 7/8 in. length (SEMS Mfd by 78189)	2
-113	8949-0040	. NUT, Hexagon, Self locking (22NM40 Mfd by 72962) ...	2
-113A	8040-0000 4242-0000	. NUT ..... ---*---	2
-114	39284	. SPACER	1
-115	38187	. SHAFT ..... ATTACHING PARTS	1
-116	28665-0031	. RING, Retaining (5100-31MD Mfd by 79136) ..... ---*---	1
-117	28186-0005	. WASHER, Flat, brass, 0.316 I.D. by ..... 0.625 O.D. by 0.005 thich	AR
	28186-0010	. WASHER, Flat, Alternate for 28186-0000, ... 0.316 I.D. by 0.625 O.D. 0.010 thick	AR
	28186-0014 28186-0010	. WASHER, Flat, Alternate for 28186-0000 ..... 0.316 I.D. by 0.625 O.D. 0.014 thick	AR
-118	17525-0001	. BEARING, Ball (F5DDC1 Mfd by 21335)	1
-119	28186-0005	. WASHER, Flat, brass, 0.316 I.D. by ..... 0.625 O.D. by 0.005 thick	AR
	36785-0005	. WASHER, Flat, Alternate for 28186-0000, ... 0.316 I.D. by 0.625 O.D. by 0.005 thick	AR
	28186-0010 36785-0005	. WASHER, Flat, Alternate for 28186-0000, ... 0.316 I.D. by 0.625 O.D. by 0.010 thick	AR
-120	26785-0005	. KEY, Woodruff, Steel	1
-121	28665-0031	. RING, Retaining (5100-31 MD Mfd by 79136)	1
-122	40871	. GEAR ASSEMBLY	1
-123	40872	. . WASHER, Spring tension ..... ATTACHING PARTS	1
-124	504-0016	. . SCREW ASSEMBLY, Washer behind head ..... brass, nickel plated stainless steel, lock washer, 4-40 thread by 1/4 in. length (SEMS Mfd by 78189)	1
-125	38305	. . PIN	1
-126	30323-0009	. . RING, Retaining (5133-9-MD Mfd by 79136) ..... ---*---	1
-127	40873	. . GEAR, Spur	1
-128	38189	. WASHER, Index	1
-129	38195-0006	. WASHER, Spring tension, (used on 35070-0128, ... 35070-1114, 35070-1128, 35070-1214)	1
	38195-0016 -0010 -0012	. WASHER, Spring tension (used on 35070-0014, ... 35070-0028, 35070-0228, 35070-0328, 35070-1014, 35070-1028, 35070-0428)	1
-130	38201	. WASHER, Key	1
-131	38200	. WASHER, Flat, Steel, 0.625 I.D. by 1.937 O.D. .... by 0.062 in. thick	1
-132	38365	. WASHER, Flat, Steel 0.630 I.D. by 1.187 O.D. ..... by 0.031 in. thick	2
-132A	40640	. BEARING, Sleeve	1

Figure & Index No.	Part No.	1 2 3 4 5 6 Description	Qty per Assy
-133	38186	. SHAFT	1
-134	36920-0014	. CLUTCH ASSEMBLY, Electric ..... (used on 35070-0014, 35070-1014, 35070-1114, 35070-1214)	1
	36920-0028	. CLUTCH ASSEMBLY, Electric ..... (used on 35070-0028, 35070-0128, 35070-0228, 35070-0328, 35070-1028, 35070-1128, 35070-1228)	1
-135	36846	. . GEAR, Spur	1
-136	36785-0001	. . KEY, Woodruff, steel	2
-137	39010-0001	. . WASHER, Flat, teflon, 0.630 I.D. by ..... 1.125 O.D. by 0.031 in. thick	1
-138	36650-0014	. . CLUTCH, Electric (TC212H Mfd by 14412 ..... used on 36920-0014)	1
	36650-0028	. . CLUTCH, Electric (TC212H Mfd by 14412 ..... used on 36920-0028)	1
-139	516-0028	. SCREW ASSEMBLY, Washer behind head, ... brass, black oxidized, stainless steel lock washer 6-32 thread by 7/16 in. length (SEMS Mfd by 78189)	1
-140	17525-0001	. BEARING, Ball (F5DDC1 Mfd by 21335)	1
-141	8951-0602	. NUT, Hexagon Self locking, 10-32 thread ..... (22NC6-02 Mfd by 72962)	4
-142			
	35073-0028	. PLATE, Idnetification (used on 35070-0028)	1
	35073-0128	. PLATE, Identification (used on 35070-0128)	1
	35073-0228	. PLATE, Identification (used on 35070-0228)	1
	35073-0328	. PLATE, Identification (used on 35070-0328)	1
	35073-0428	. PLATE, Identification (used on 35070-0428)	1
			1
	35073-1028	. PLATE, Identification (used on 35070-1028)	1
	35073-1128	. PLATE, Identification (used on 35070-1128)	1
	35073-1228	. PLATE, Identification (used on 35070-1228)	1
		ATTACHING PARTS	
-143	8956-2010	. SCREW, Tapping, thread forming, steel ..... black oxidized No. 2 by 5/32 in. length (Z Mfd by 45772)	2
-144	36844	. CASE	1

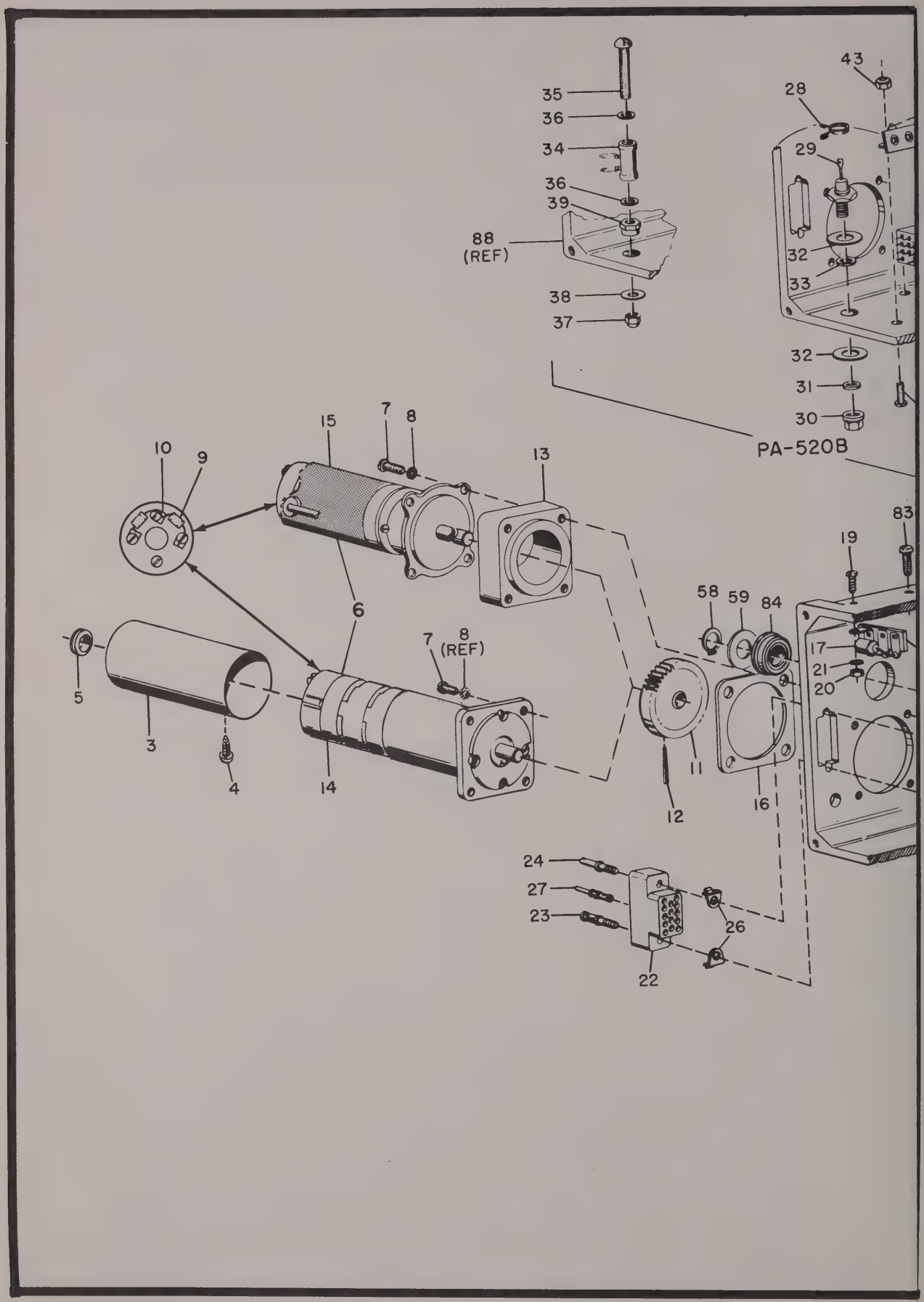

Figure 7-2. PA-520B Actuator Exploded View

Figure & Index No.	Part Number	Description	Qty per Assy
	38100-0028	ACTUATOR ASSEMBLY, PA-520A, 28 V	1
	38100-0128	ACTUATOR ASSEMBLY, PA-520A, 28 V	1
	38100-0228	ACTUATOR ASSEMBLY, PA-520A, 28 V	1
	40280-0028	ACTUATOR ASSEMBLY, PA-520B, 28 V	1
	40280-0128	ACTUATOR ASSEMBLY, PA-520B, 28 V	1
	40280-0328	ACTUATOR ASSEMBLY, PA-520B, 28 V	1
	40280-0428	ACTUATOR ASSEMBLY, PA-520B, 28 V	1
-1	36848-0003	. PLATE	1
		(ATTACHING PARTS)	
-2	506-0024	. SCREW, Assembled washer, bdgh, brs, np, No. 4-40 thd by 7/8 in. lg, sst lockwasher	4
		- - - ■ - - -	
-3	36780	. COVER (used on 38100-0014, -0028, -0128, -0228, and 40280-0128, -0328, -0428)	1
		(ATTACHING PARTS)	
-4	8956-2010	. SCREW, Self-tapping	1
		- - - ■ - - -	
-5	11584	. GROMMET (used on 38100-0028, -0128, -0228, and 40280-0128, -0328, -0428)	1
			1
-6	36921-1028	. MOTOR ASSEMBLY (used on 38100-0028)	1
	36921-2028	. MOTOR ASSEMBLY (used on 38100-0128, 40280-0128, and -0328)	1
	36921-3028	. MOTOR ASSEMBLY (used on 38100-0228)	1
	36921-6028	. MOTOR ASSEMBLY (used on 40280-0428)	1
	40843	. MOTOR ASSEMBLY (used on 40280-0028)	1
		(ATTACHING PARTS)	
-7	104-0024	. SCREW, Machine, bdgh, brs, np, No. 4-40 thd by 3/8 in. lg (used on 36921-[all])	4
	104-0100	. SCREW, Machine, bdgh, brs, np, No. 4-40 thd by 1 in. lg (used on 40843)	4
-8	8543-0000	. WASHER, Lock, split, brz, np, 0.115 ID by 0.162 OD by 0.031 in. thk	4
		- - - ■ - - -	
-9	32423-9223	. . CAPACITOR, Fixed, plastic, 0.022 uF ±10%, 80 Vdc (56289 type 192P)	2
-10	5216	. . TERMINAL, Lug	1
-11	36776	. . GEAR, Spur	1
		(ATTACHING PARTS)	
-12	216-0040	. . PIN, Grooved, headless, 5/8 in. lg (73957 part no. GP1093 x 625-5)	1
		- - - ■ - - -	
-13	40713	. . BLOCK (used on 40280-0028)	1
-14	36874-2402	. . MOTOR (used on 36921-1028)	1
	36874-2403	. . MOTOR (used on 36921-2028)	1
	36874-2404	. . MOTOR (used on 36921-3028)	1
	36874-2407	. . MOTOR (used on 36921-6028)	1
-15	40712	. . MOTOR (used on 40843)	1
-16	30388	. WASHER, Aluminum	1
-17	8931-0401	. SEMICONDUCTOR DEVICE, Diode (01295 part no. 1N2070)	1
-18	50184-0021	. TERMINAL BOARD	1
		(ATTACHING PARTS)	
-19	113-0020	. SCREW, Machine, bdgh, brs, blk oxd, No. 3-48 thd by 3/8 in. lg	1
-20	4561	. NUT, Hexagon, brs, np, No. 3-48 thd by 0.062 in. thk	1
-21	4103	. WASHER, Lock, sst, 0.105 ID by 0.220 OD by 0.025 in. thk (78189 part no. 1703)	1
		- - - ■ - - -	
-22	38560-0114	. CONNECTOR, Body, electric (81312 part no. MRAC14P)	1
		(ATTACHING PARTS)	
-23	35862-0001	. GUIDE, Socket (81312 part no. G700)	1
-24	35862-0002	. GUIDE, Pin (81312 part no. G700)	1
-25	—	. NUT, Hexagon, brs, gold pl, No. 4-40 (supplied with 35862-0001 and -0002)	2
-26	29916-0001	. TABS, Lock (81312 part no. MREV)	2
		- - - ■ - - -	

Figure & Index No.	Part No.	1 2 3 4 5 6 Description	Qty per Assy
-133	38186	. SHAFT	1
-134	36920-0014	. CLUTCH ASSEMBLY, Electric (used on 35070-0014, 35070-1014, 35070-1114, 35070-1214)	1
	36920-0028	. CLUTCH ASSEMBLY, Electric (used on 35070-0028, 35070-0128, 35070-0228, 35070-0328, 35070-1028, 35070-1128, 35070-1228)	1
-135	36846	. . GEAR, Spur	1
-136	36785-0001	. . KEY, Woodruff, steel	2
-137	39010-0001	. . WASHER, Flat, teflon, 0.630 I.D. by 1.125 O.D. by 0.031 in. thick	1
-138	36650-0014	. . CLUTCH, Electric (TC212H Mfd by 14412 used on 36920-0014)	1
	36650-0028	. . CLUTCH, Electric (TC212H Mfd by 14412 used on 36920-0028)	1
-139	516-0028	. SCREW ASSEMBLY, Washer behind head, brass, black oxidized, stainless steel lock washer 6-32 thread by 7/16 in. length (SEMS Mfd by 78189)	1
-140	17525-0001	. BEARING, Ball (F5DDC1 Mfd by 21335)	1
-141	8951-0602	. NUT, Hexagon Self locking, 10-32 thread (22NC6-02 Mfd by 72962)	4
-142			
	35073-0028	. PLATE, Idnetification (used on 35070-0028)	1
	35073-0128	. PLATE, Identification (used on 35070-0128)	1
	35073-0228	. PLATE, Identification (used on 35070-0228)	1
	35073-0328	. PLATE, Identification (used on 35070-0328)	1
	35073-0428	. PLATE, Identification (used on 35070-0428)	1
			1
	35073-1028	. PLATE, Identification (used on 35070-1028)	1
	35073-1128	. PLATE, Identification (used on 35070-1128)	1
	35073-1228	. PLATE, Identification (used on 35070-1228)	1
		ATTACHING PARTS	
-143	8956-2010	. SCREW, Tapping, thread forming, steel black oxidized No. 2 by 5/32 in. length (Z Mfd by 45772)	2
-144	36844	. CASE	1

Figure & Index No.	Part Number	Description	Qty per Assy
	38100-0028	ACTUATOR ASSEMBLY, PA-520A, 28 V	1
	38100-0128	ACTUATOR ASSEMBLY, PA-520A, 28 V	1
	38100-0228	ACTUATOR ASSEMBLY, PA-520A, 28 V	1
	40280-0028	ACTUATOR ASSEMBLY, PA-520B, 28 V	1
	40280-0128	ACTUATOR ASSEMBLY, PA-520B, 28 V	1
	40280-0328	ACTUATOR ASSEMBLY, PA-520B, 28 V	1
	40280-0428	ACTUATOR ASSEMBLY, PA-520B, 28 V	1
-1	36848-0003	. PLATE	1
		(ATTACHING PARTS)	
-2	506-0024	. SCREW, Assembled washer, bdgh, brs, np, No. 4-40 thd by 7/8 in. lg, sst lockwasher	4
		- - - * - - -	
-3	36780	. COVER (used on 38100-0014, -0028, -0128, -0228, and 40280-0128, -0328, -0428)	1
		(ATTACHING PARTS)	
-4	8956-2010	. SCREW, Self-tapping	1
		- - - * - - -	
-5	11584	. GROMMET (used on 38100-0028, -0128, -0228, and 40280-0128, -0328, -0428)	1
			1
-6	36921-1028	. MOTOR ASSEMBLY (used on 38100-0028)	1
	36921-2028	. MOTOR ASSEMBLY (used on 38100-0128, 40280-0128, and -0328)	1
	36921-3028	. MOTOR ASSEMBLY (used on 38100-0228)	1
	36921-6028	. MOTOR ASSEMBLY (used on 40280-0428)	1
	40843	. MOTOR ASSEMBLY (used on 40280-0028)	1
		(ATTACHING PARTS)	
-7	104-0024	. SCREW, Machine, bdgh, brs, np, No. 4-40 thd by 3/8 in. lg (used on 36921-[all])	4
	104-0100	. SCREW, Machine, bdgh, brs, np, No. 4-40 thd by 1 in. lg (used on 40843)	4
-8	8543-0000	. WASHER, Lock, split, brz, np, 0.115 ID by 0.162 OD by 0.031 in. thk	4
		- - - * - - -	
-9	32423-9223	. . CAPACITOR, Fixed, plastic, 0.022 uF ±10%, 80 Vdc (56289 type 192P)	2
-10	5216	. . TERMINAL, Lug	1
-11	36776	. . GEAR, Spur	1
		(ATTACHING PARTS)	
-12	216-0040	. . PIN, Grooved, headless, 5/8 in. lg (73957 part no. GP1093 x 625-5)	1
		- - - * - - -	
-13	40713	. . BLOCK (used on 40280-0028)	1
-14	36874-2402	. . MOTOR (used on 36921-1028)	1
	36874-2403	. . MOTOR (used on 36921-2028)	1
	36874-2404	. . MOTOR (used on 36921-3028)	1
	36874-2407	. . MOTOR (used on 36921-6028)	1
-15	40712	. . MOTOR (used on 40843)	1
-16	30388	. WASHER, Aluminum	1
-17	8931-0401	. SEMICONDUCTOR DEVICE, Diode (01295 part no. 1N2070)	1
-18	50184-0021	. TERMINAL BOARD	1
		(ATTACHING PARTS)	
-19	113-0020	. SCREW, Machine, bdgh, brs, blk oxd, No. 3-48 thd by 3/8 in. lg	1
-20	4561	. NUT, Hexagon, brs, np, No. 3-48 thd by 0.062 in. thk	1
-21	4103	. WASHER, Lock, sst, 0.105 ID by 0.220 OD by 0.025 in. thk (78189 part no. 1703)	1
		- - - * - - -	
-22	38560-0114	. CONNECTOR, Body, electric (81312 part no. MRAC14P)	1
		(ATTACHING PARTS)	
-23	35862-0001	. GUIDE, Socket (81312 part no. G700)	1
-24	35862-0002	. GUIDE, Pin (81312 part no. G700)	1
-25	—	. NUT, Hexagon, brs, gold pl, No. 4-40 (supplied with 35862-0001 and -0002)	2
-26	29916-0001	. TABS, Lock (81312 part no. MREV)	2
		- - - * - - -	

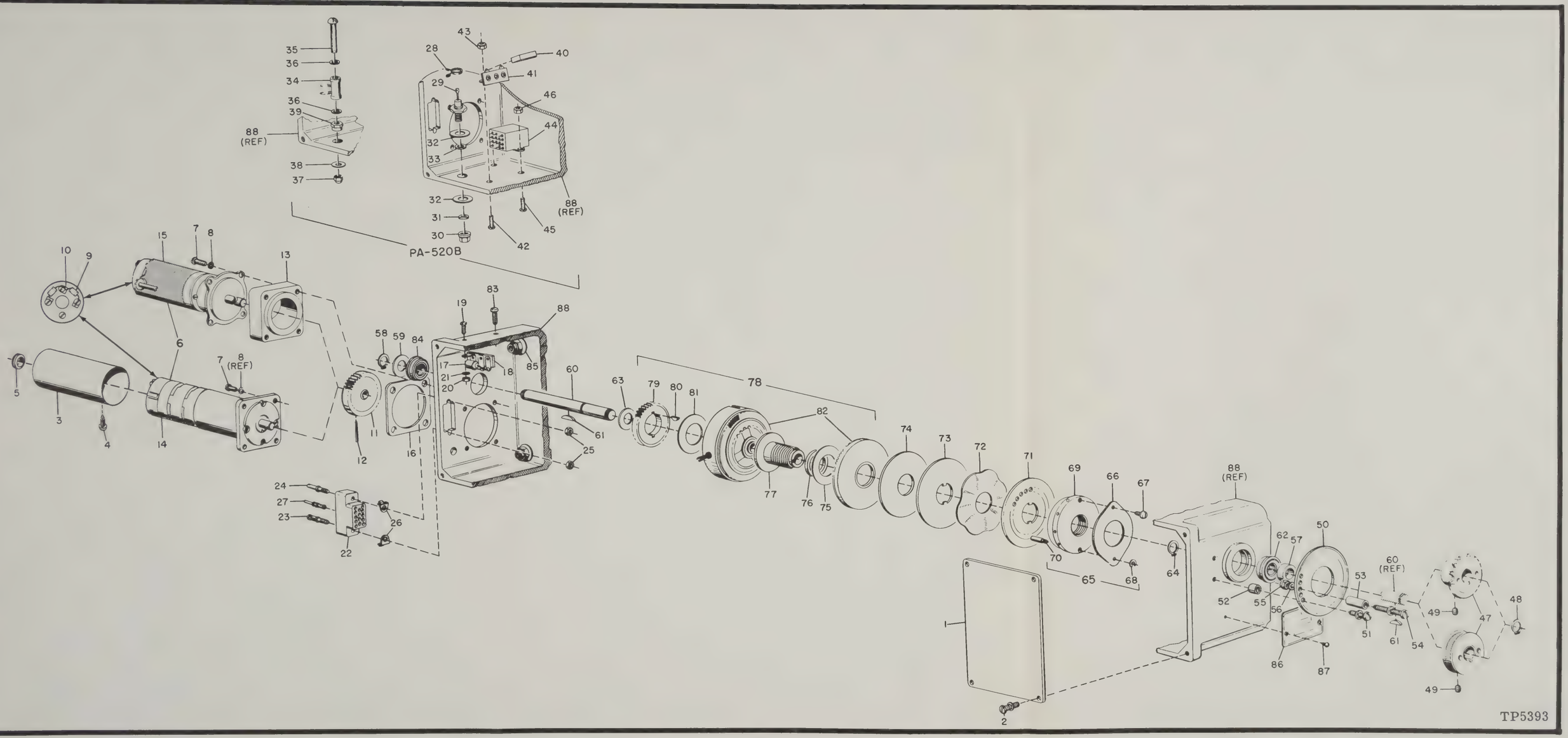

Figure 7-2. PA-520B Actuator Exploded View

Figure & Index No.	Part Number	1 2 3 4 5 6 Description	Qty per Assy
	38100-0028	ACTUATOR ASSEMBLY, PA-520A, 28 V.	1
	38100-0128	ACTUATOR ASSEMBLY, PA-520A, 28 V.	1
	38100-0228	ACTUATOR ASSEMBLY, PA-520A, 28 V.	1
	40280-0028	ACTUATOR ASSEMBLY, PA-520B, 28 V.	1
	40280-0128	ACTUATOR ASSEMBLY, PA-520B, 28 V.	1
	40280-0328	ACTUATOR ASSEMBLY, PA-520B, 28 V.	1
	40280-0428	ACTUATOR ASSEMBLY, PA-520B, 28 V.	1
-1	36848-0003	. PLATE	1
		(ATTACHING PARTS)	
-2	506-0024	. SCREW, Assembled washer, bdgh, brs, np, No. 4-40 thd by 7/8 in. lg, sst lockwasher	4
		- - - * - - -	
-3	36780	. COVER (used on 38100-0014, -0028, -0128, -0228, and 40280-0128, -0328, -0428)	1
		(ATTACHING PARTS)	
-4	8956-2010	. SCREW, Self-tapping	1
		- - - * - - -	
-5	11584	. GROMMET (used on 38100-0028, -0128, -0228, and 40280-0128, -0328, -0428)	1
			1
-6	36921-1028	. MOTOR ASSEMBLY (used on 38100-0028).	1
	36921-2028	. MOTOR ASSEMBLY (used on 38100-0128, 40280-0128, and -0328)	1
	36921-3028	. MOTOR ASSEMBLY (used on 38100-0228).	1
	36921-6028	. MOTOR ASSEMBLY (used on 40280-0428).	1
	40843	. MOTOR ASSEMBLY (used on 40280-0028).	1
		(ATTACHING PARTS)	
-7	104-0024	. SCREW, Machine, bdgh, brs, np, No. 4-40 thd by 3/8 in. lg (used on 36921-[all])	4
	104-0100	. SCREW, Machine, bdgh, brs, np, No. 4-40 thd by 1 in. lg. (used on 40843)	4
-8	8543-0000	. WASHER, Lock, split, brz, np, 0.115 ID by 0.162 OD by 0.031 in. thk	4
		- - - * - - -	
-9	32423-9223	. . CAPACITOR, Fixed, plastic, 0.022 uF ±10%, 80 Vdc (56289 type 192P)	2
-10	5216	. . TERMINAL, Lug	1
-11	36776	. . GEAR, Spur	1
		(ATTACHING PARTS)	
-12	216-0040	. . PIN, Grooved, headless, 5/8 in. lg (73957 part no. GP1093 x 625-5)	1
		- - - * - - -	
-13	40713	. . BLOCK (used on 40280-0028)	1
-14	36874-2402	. . MOTOR (used on 36921-1028)	1
	36874-2403	. . MOTOR (used on 36921-2028)	1
	36874-2404	. . MOTOR (used on 36921-3028)	1
	36874-2407	. . MOTOR (used on 36921-6028)	1
-15	40712	. . MOTOR (used on 40843)	1
-16	30388	. WASHER, Aluminum.	1
-17	8931-0401	. SEMICONDUCTOR DEVICE, Diode (01295 part no. 1N2070)	1
-18	50184-0021	. TERMINAL BOARD	1
		(ATTACHING PARTS)	
-19	113-0020	. SCREW, Machine, bdgh, brs, blk oxd, No. 3-48 thd by 3/8 in. lg	1
-20	4561	. NUT, Hexagon, brs, np, No. 3-48 thd by 0.062 in. thk	1
-21	4103	. WASHER, Lock, sst, 0.105 ID by 0.220 OD by 0.025 in. thk (78189 part no. 1703)	1
		- - - * - - -	
-22	38560-0114	. CONNECTOR, Body, electric (81312 part no. MRAC14P)	1
		(ATTACHING PARTS)	
-23	35862-0001	. GUIDE, Socket (81312 part no. G700)	1
-24	35862-0002	. GUIDE, Pin (81312 part no. G700).	1
-25	—	. NUT, Hexagon, brs, gold pl, No. 4-40 (supplied with 35862-0001 and -0002)	2
-26	29916-0001	. TABS, Lock (81312 part no. MREV).	2
		- - - * - - -	

Figure & Index No.	Part Number	Description 1 2 3 4 5 6	Qty per Assy
-27	35861-0120	. CONTACT, Electrical (81312 part no. 100-1020P) (used on PA-520A)	5
	35861-0120	. CONTACT, Electrical (81312 part no. 100-1020P) (used on PA-520B)	9
-28	40715	. CLIP, Electrical (72653 part no. 8838-1R) (used on 40280-0028 and -0328)	1
-29	40284-3309	. SEMICONDUCTOR DEVICE, Diode, Zener (04713 part no. 1N3309A) (used on 40280-0028 and -0328)	1
		(ATTACHING PARTS)	
-30	40728-1628	. NUT, Hexagon	1
-31	28558-0011	. WASHER, Flat	1
-32	—	. WASHER, Mica (supplied with 40284-3309)	2
-33	—	. WASHER, Teflon (supplied with 40284-3309)	1
		- - - * - - -	
-34	35987-0400	. RESISTOR, Fixed, ww, 40 ohms ±5%, 8 W (used on 40280-0128)	1
		(ATTACHING PARTS)	
-35	129-0148	. SCREW, Round hd, brs, np, No. 10-32 thd by 1-3/4 in. lg	1
-36	40726	. WASHER, Flat	2
-37	40946	. NUT, Hexagon, No. 10-32	1
-38	12446	. WASHER	1
-39	8949-0002	. NUT, Hexagon, self-locking, stl, cd pl, No. 10-32 thd	1
		- - - * - - -	
-40	40477-0200	. RECTIFIER, Bridge, silicon (14936 part no. KBPOZ) (used on PA-520B)	1
-41	50184-0004	. TERMINAL BOARD (used on PA-520B)	1
		(ATTACHING PARTS)	
-42	113-0020	. SCREW, Machine, bdgh, brs, blk oxd, No. 3-48 thd by 5/16 in. lg	1
-43	8949-0038	. NUT, Hexagon, self-locking, stl, cd pl, No. 3-48 thd	1
		- - - * - - -	
-44	40710	. RELAY, 4PDT, 26.5 V, 2 amp (02289 part no. 4B-3477) (used on PA-520B)	1
		(ATTACHING PARTS)	
-45	114-0020	. SCREW, Binding hd, brs, blk oxd, No. 4-40 thd by 5/16 in. lg	2
-46	8949-0040	. NUT, Hexagon, self-locking, stl, cd pl, No. 4-40 thd	2
		- - - * - - -	
-47	38633-0000	. CAPSTAN (used on PA-520A)	1
	38633-0002	. CAPSTAN (used on 40280-0028, -0128, and -0428)	1
	28324	. SPROCKET (used on 40280-0328)	1
-48	28665-0031	. RING, Retaining (79136 part no. S100-31MD)	1
		(ATTACHING PARTS)	
-49	309-0024	. SETSCREW, Fluted skt, cup pt, stl, cd pl, No. 10-32 thd by 3/8 in. lg (used on 38633-0000 and -0002)	1
	309-0012	. SETSCREW, Fluted skt, cup pt, stl, cd pl, No. 10-32 thd by 3/16 in. lg (used on 28324)	1
		- - - * - - -	
-50	36783	. PLATE, Guard	1
		(ATTACHING PARTS)	
-51	504-0032	. SCREW, Assembled washer, bdgh, brs, np, No. 4-40 thd by 1/2 in. lg, sst lockwasher (used with 28324)	2
	504-0028	. SCREW, Assembled washer, bdgh, brs, np, No. 4-40 thd by 7/16 in. lg, sst lockwasher (used with 38633-0000 and -0002)	2
-52	29609-0016	. SPACER (used with 28324)	2
	11884	. SPACER (used with 38633-0000 and -0002)	
		- - - * - - -	
-53	29609-0040	. SPACER (used with 28324)	2
	32849-0040	. SPACER (used with 38633-0000 and -0002)	2
		(ATTACHING PARTS)	
-54	504-0056	. SCREW, Assembled washer, bdgh, brs, np, No. 4-40 thd by 7/8 in. lg, sst lockwasher	2
-55	8949-0040	. NUT, Hexagon, self-locking (72962 part no. 22NM40) (used with 28324)	2
	8040	. NUT, Brass, np, No. 4-40 (used with 38633-0000 and -0002)	2
-56	4242	. WASHER, Lock, int tooth, phos br, np, No. 4 (78189 part no. 1904) (used with 38633-0000 and -0002)	2
		- - - * - - -	
-57	39284	. SPACER	1

Figure & Index No.	Part Number	1 2 3 4 5 6 Description	Qty per Assy
-58	28665-0031	. RING, Retaining (79136 part no. 5100-31MD)	1
-59	28186-0005	. WASHER, Flat, 0.316 ID by 0.625 OD by 0.010 thk	AR
-60	38187	. SHAFT	1
-61	36785-0005	. KEY, Woodruff, stl	2
-62	17525-0001	. BEARING, Ball (21335 part no. F5DDC1)	1
-63	28186-0010	. WASHER, Flat, 0.316 ID by 0.625 OD by 0.010 thk	AR
-64	28665-0031	. RING, Retaining (79136 part no. 5100-31MD)	1
-65	40875	. HUB ASSEMBLY	1
-66	40872	. . WASHER, Spring tension (ATTACHING PARTS)	1
-67	504-0016	. . SCREW, Assembled washer, bdgh, brs, np, No. 4-40 thd by 1/4 in. lg, sst lockwasher (78189 part no. SEMS)	1
-68	30323-0009	. . RING, Retaining (79136 part no. 5133-9MD) - - - * - - -	1
-69	40874	. . HUB, Body	1
-70	38305	. . . PIN	1
-71	38189	. WASHER, Index	1
-72	38195-0012	. WASHER, Spring tension (used on PA-520B and 38100-0014, -0028, and -0128)	1
	38195-0016	. WASHER, Spring tension (used on 38100-0228)	1
-73	38201	. WASHER, Key	1
-74	38200	. WASHER, Flat, stl, 0.625 ID by 1.937 OD by 0.062 in. thk	1
-75	38365	. WASHER, Flat, stl, 0.630 ID by 1.187 OD by 0.031 in. thk	1
-76	40604	. BEARING, Sleeve	1
-77	38186	. SHAFT	1
-78	36920-0028	. CLUTCH ASSEMBLY, Electric (used on PA-520A, 28 V units, and PA-520B)	1
	36920-0014	. CLUTCH ASSEMBLY, Electric (used on 38100-0014)	1
-79	36846	. . GEAR, Spur	1
-80	36785-0001	. . KEY, Woodruff, stl	2
-81	39010-0000	. . WASHER, Flat, Teflon, 0.630 ID by 1.125 OD by 0.031 in. thk	1
-82	36650-0014	. . CLUTCH, Electric (14412 part no. TC212H) (used with 36920-0014)	1
	36650-0028	. . CLUTCH, Electric (14412 part no. TC212H) (used with 36920-0028)	1
-83	516-0024	. SCREW, Assembled washer, bdgh, brs, blk oxd, No. 6-32 thd by 3/8 in. lg, sst lockwasher (78189 part no. SEMS)	1
-84	17525-0001	. BEARING, Ball (21335 part no. F5DDC1)	1
-85	8951-0602	. NUT, Self-locking, clinch, No. 10-32 thd (72962 part no. 22NC6-02)	4
-86	38101-0028	. PLATE, Identification (used on 38100-0028)	1
	38101-0128	. PLATE, Identification (used on 38100-0128)	1
	38101-0228	. PLATE, Identification (used on 38100-0228)	1
	40282-0028	. PLATE, Identification (used on 40280-0028)	1
	40282-0128	. PLATE, Identification (used on 40280-0128)	1
	40282-0328	. PLATE, Identification (used on 40280-0328)	1
	40282-0428	. PLATE, Identification (used on 40280-0428) (ATTACHING PARTS)	1
-87	8956-2010	. SCREW, Tapping, thd forming, stl, blk oxd, No. 2 by 5/32 in. lg (45772 part no. 2) - - - * - - -	2
-88	36844-1000	. CASE (used on PA-520A)	1
	36844-2000	. CASE (used on 40280-0028, -0128, and -0328)	1
	36844-3000	. CASE (used on 40280-0428)	1

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C6	29A	40465-0110
CR1	55	8931-0401
CR2	16A	26052-9821
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APPENDIX 1

WIRING DIAGRAMS
FOR
CESSNA 400A NAV-O-MATIC AUTOPILOT TEST HARNESS AND EQUIPMENT

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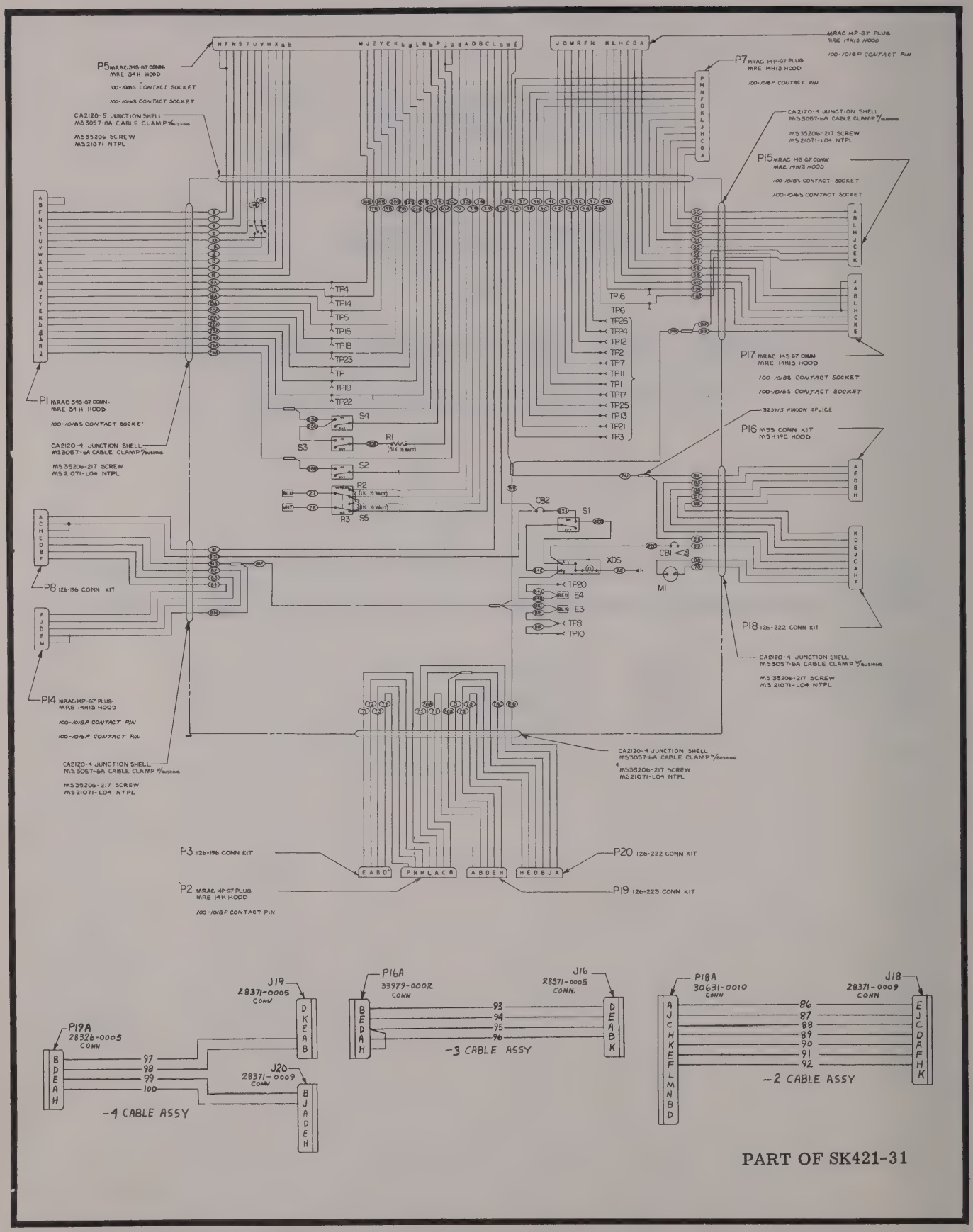
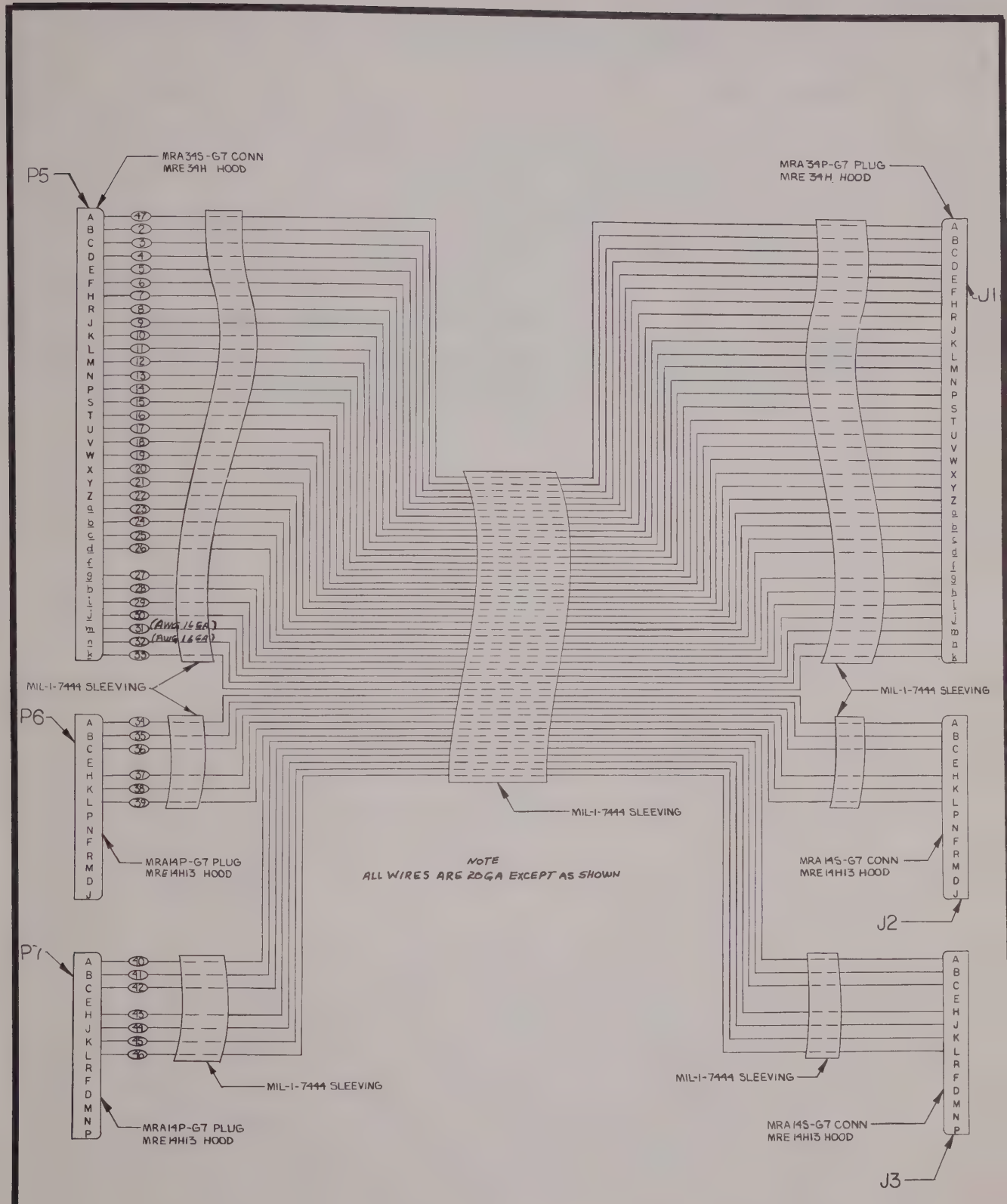


Figure A-1. 9799001 400A Nav-O-Matic Test Set



SEE FIGURE 2-1 FOR INTERCONNECTING DIAGRAM

Figure A-2. 9799010 Extension Cable

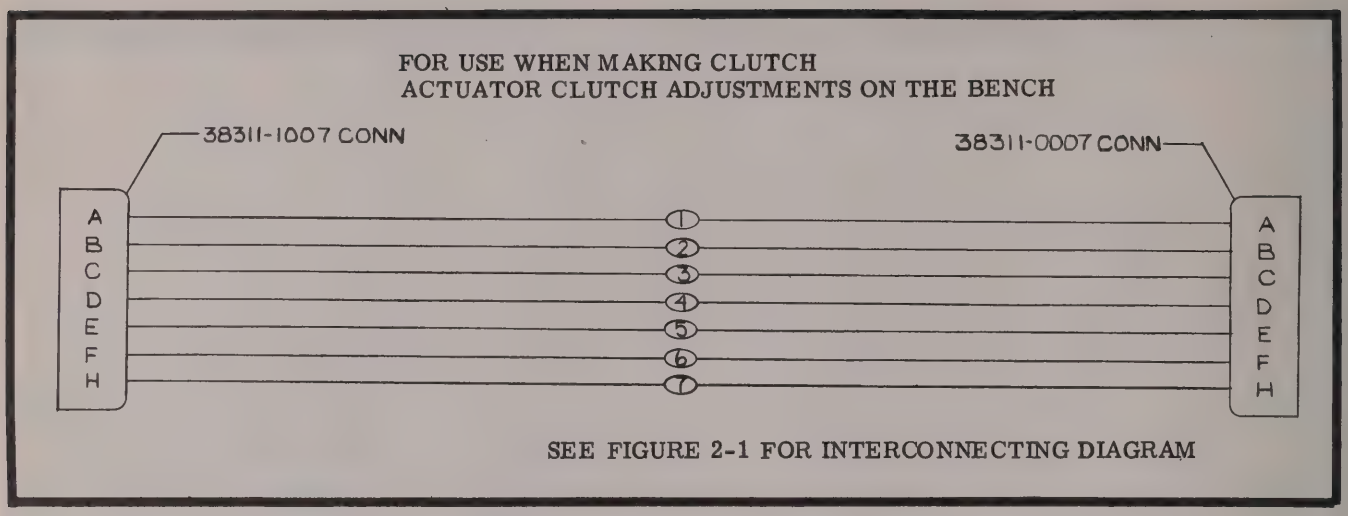


Figure A-3. 9799007 PA500A Actuator Adapter Cable Assembly

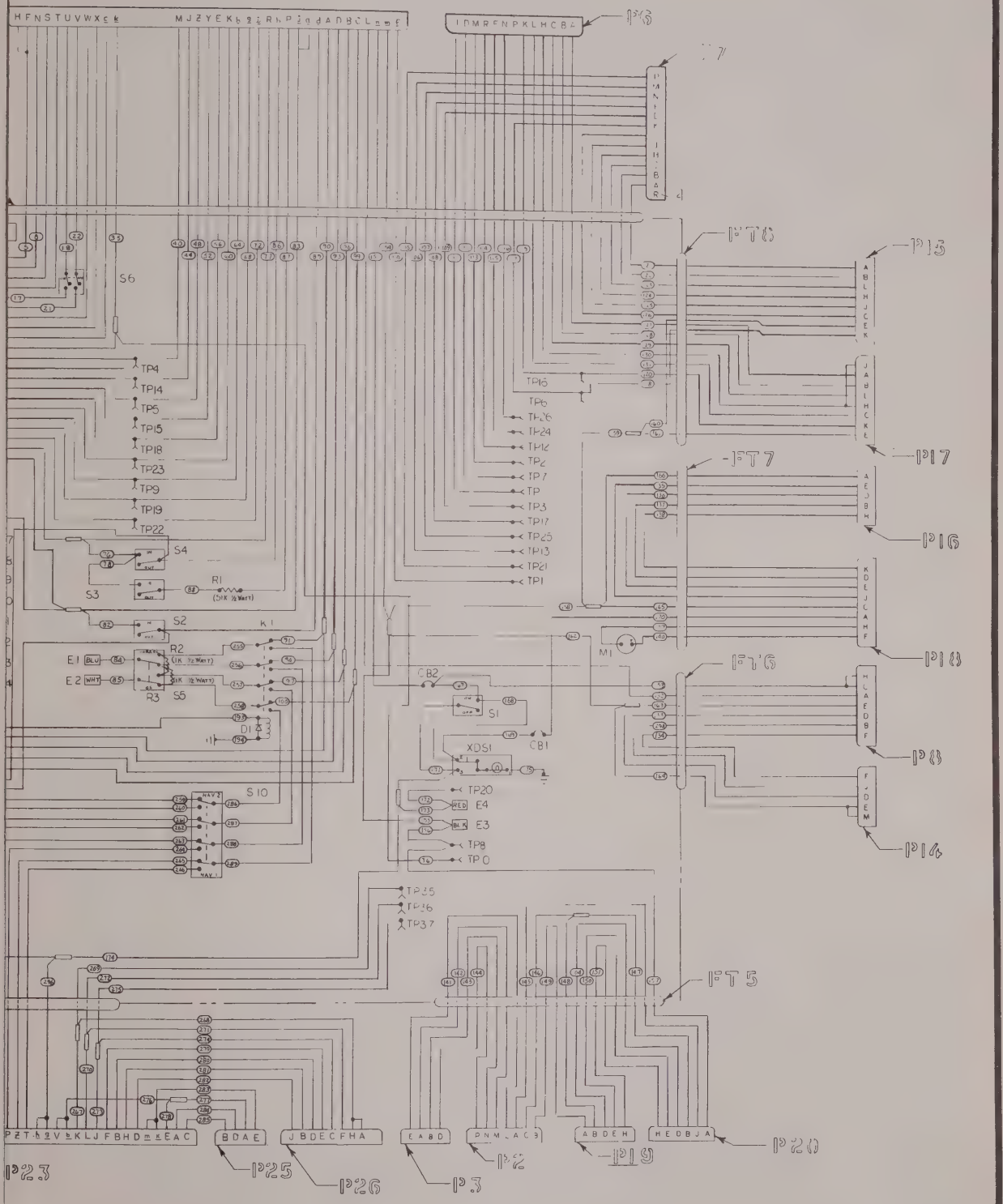


Figure A-4. 9799002-31 400A Nav-O-Matic/Integrated Flight Control System Test Unit

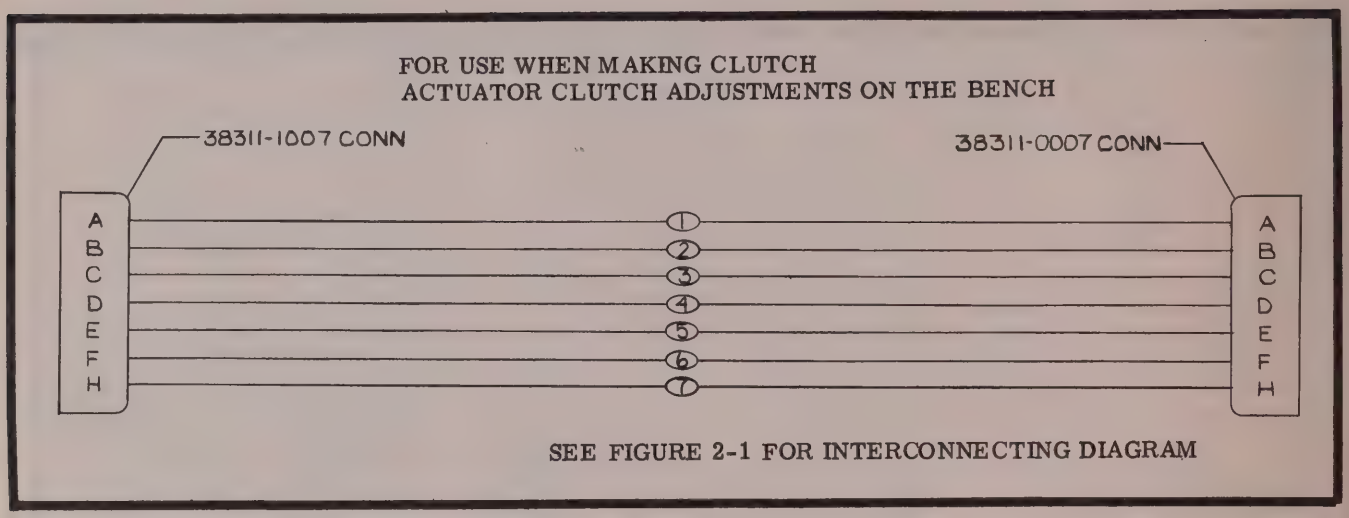


Figure A-3. 9799007 PA500A Actuator Adapter Cable Assembly

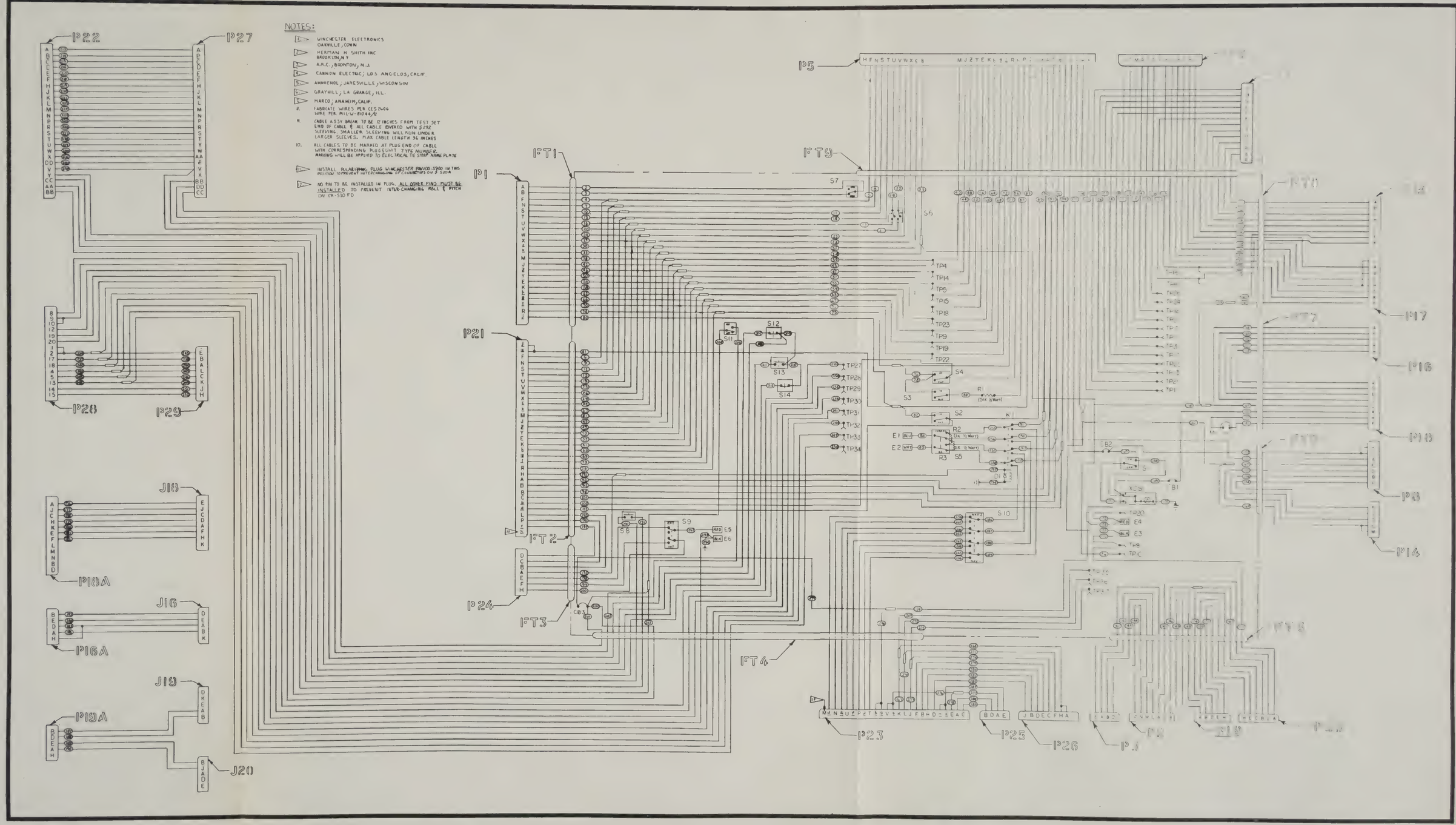


Figure A-4. 9799002-31 400A Nav-O-Matic/Integrated Flight Control System Test Unit

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